MedGeo’17
7th International Conference on Medical Geology
August 28 - September 01, 2017
Moscow, Russia
Conference Materials
Welcome Message to Participants of the 7th International Conference on Medical Geology MedGeo'17 from Sergei Donskoi, Minister of Natural Resources and Environment of the Russian Federation

It gives me great pleasure to welcome the participants and guests of the 7th IMGA International Conference on Medical Geology (MedGeo’17).

This year the Conference is held for the first time on Russian Federation territory, which is unique in its variety of geological features. This diversity is required for the assessment of various properties of geological processes and phenomena influence, as well as for examination of the effects of climate change and water and soil composition on human health.

This is extremely important for both the economy’s sustainable development and for ensuring a safe living environment, health protection, and ability for professional activity within the population. Vladimir Putin, President of the Russian Federation, has declared this year as the Year of Ecology in Russia because discussions of these topics are gaining particular importance in our country.

MedGeo traditionally attracts the attention of a large number of participants and the interest of the international scientific community because of the topics discussed during the Conference.

I am confident that this year’s event will not differ in the amount of participation or importance to the scientific community. MedGeo’17 will be an effective platform for the exchange of knowledge and experiences accumulated in the various fields of natural sciences represented at the Conference: Medicine, Geology, Ecology and Biology.

The goal of the Conference is to create a stimulus for the further development of Medical Geology, a very topical area of science, and to identify new ways to conduct research. These outcomes are focused on protecting the health of the population on our Planet.

I wish you a successful Conference and fruitful discussion!

Faithfully yours,
Sergei Donskoi
Уважаемые коллеги!

Мы рады пригласить вас принять участие в VII Международной конференции по медицинской геологии, которая пройдет в Москве с 28 августа по 01 сентября 2017 года. Проведение очередной конференции МЕДГЕО в столице России приурочено, в том числе, к 25-летнему юбилею Российского геологического общества (РОСТОЕ).

В мероприятии примут участие специалисты из России, стран ближнего и дальнего зарубежья, а также многочисленные гости.

Организаторами конференции выступают Международная медико-геологическая ассоциация (ММГА-IMGA) и Российское геологическое общество (РОСТОЕ), при поддержке федеральных органов исполнительной власти и профильных профессиональных организаций.

Международная медико-геологическая ассоциация (ММГА-IMGA) была основана в январе 2004 года. В настоящее время в составе ММГА-IMGA насчитывается примерно 300 членов из 50 стран мира. ММГА-IMGA объединяет в своих рядах геологов и представителей медико-биологического сообщества практически во всех частях света. Благодаря этому, актуальное научное направление, изучающее различные аспекты воздействия геологических объектов и процессов на здоровье людей, – медицинская геология получила в последние два десятилетия широкое распространение в мире и служит надежным мостом в отношениях между различными областями геологических наук, биологии и медицины.

Каждые два года ММГА-IMGA проводит Международную конференцию МЕДГЕО. РОСТОЕ получило право на проведение МЕДГЕО 2017 года в России. Организаторы видят цель Конференции в консолидации усилий учёных и специалистов различных направлений естественных наук и в деле поиска новых решений экологических и медицинских проблем, консолидации междисциплинарных исследований и обмена опытом представителей различных специальностей. На конференции участники имеют возможность познакомиться с новейшими результатами в области геохимии, биологии, геологии, геоэкологии, гидрогеологии, эпидемиологии, химии, медицины, диетологии и токсикологии, профессиональных заболеваний и др.

В программе Конференции запланированы пленарные и секционные заседания, круглые столы и семинары, экскурсии в музеи геологического и медицинского профиля, а также на природные объекты. Важной составляющей частью мероприятия станет выставка, на которой участники Конференции смогут ознакомиться с новинками и последними достижениями ведущих российских и мировых производителей оборудования и его приложений в областях геологии, экологии, геохимии, геоэкологии, гидрогеологии, геохимии, биологии, медицины, диетологии и токсикологии, профессиональных заболеваний и др.

По результатам мероприятий Конференции планируется подготовить сборник научных трудов, который будет представлен на Всероссийской научной конференции. Конференция будет организована на английском языке.

Будем рады видеть вас в числе участников VII Международной конференции по медицинской геологии.

С уважением,

Президент РОСТОЕ,
Сопредседатель VII Международной конференции по медицинской геологии

Орлов В.П.

Dear Colleagues!

On behalf of the Russian Geological Society, I am glad to invite you to participate in the 7th International Conference on Medical Geology “MedGeo2017” to be held in Moscow, Russia, August 28 – September 1, 2017.

The Russian Geological Society (ROSGEO) hosts the Conference with the support of the Ministry of Natural Resources and Ecology of Russian Federation, Ministry of Health Protection of Russian Federation and the International Medical Geology Association (IMGA).

The location of MedGeo2017 is chosen not by chance. On the one part, it is the first time when the Conference will take place in Russia, on the other part, Russia is famous for its mineral resources, which however affect health of the professionals and population, and thus there is a need to conduct further research and share information in this field of science. In addition, we are going to celebrate the 25th Anniversary of the Russian Geological Society, which is the initiator and one of the main organizers of MedGeo17.

Moscow, Russia is an exciting city to visit. Known as the “City on Seven Hills”, it was founded in 1147 by Prince Yuri Dolgoruky and has the great history. Nowadays, Moscow is a modern multicultural metropolis with the population of more than 12 million people. The capital of Russia is perfect for business opportunities and cultural events. It is one of the best locations for welcoming people from all over the world.

Every two years participants gather for MedGeo Conferences, where they update the outstanding Scientific Program on the latest global perspectives on medical geology. MedGeo conference brings together geologists, geochemists, mineralogists, hydrologists, geophysicists, geographers, physicians, chemists, biologists, microbiologists, toxicologists, decision makers and others who study the effects of geological processes, objects, phenomena, materials (minerals, ores, volcano emissions, atmospheric dust, water and elements, falling into their composition and etc.) and other natural processes as well as terms under which such effects become possible.

The highly topical program of the Conference will include plenary lectures, keynote lectures, courses and workshops as well as field trips, which will give the participants the better understanding of the main issues on medical geology.

We believe that your attendance and active participation will guarantee the success of MedGeo2017 as it will be a unique opportunity to share knowledge with colleagues from all over the world.

We look forward to welcome you in Moscow in 2017!

Faithfully yours,

ROSCEO President
Co-Chairman of the 7th International Conference on Medical Geology

Victor Orlov
Dear Friends and Colleagues

On behalf of the International Medical Geology Association (IMGA), it is a great pleasure to welcome you to the 7th International Conference on Medical Geology (MEDGEO’17).

MEDGEO’17 brings together experts, professors, researchers, and students from the geosciences and bioscience fields to interchange advances in their research, to perform fruitful discussions and to stimulate interdisciplinary links. This 7th Conference will have also an outstanding impact on the consolidation of IMGA as an international platform for researchers and professionals working on environment, health, and related areas to meet and share the latest understanding of a wide range of naturally and environmental induced health issues.

The activities developed in MEDGEO’17 together with our association IMGA, contribute to improve all efforts that address local, national and global health impacts of environmental and natural factors promoting multidisciplinary actions.

We are sure that Medical Geology research is extremely promising and MEDGEO’17 contributions of senior and young colleagues compiled in this Book of Abstracts, will promote the international scientific exchange contributing to create healthier communities.

Once again, the International Medical Geology Association welcomes you to the seventh edition of its main scientific event, MEDGEO 17 in MOSCOW, hoping that friendship and professional contacts will strengthen in a very productive and outstanding international scientific meeting.

Prof. Nelly Mañay, PhD
IMGA chairperson
INTERNATIONAL SCIENTIFIC COMMITTEE

Nelly Mannay – University of the Republic of Uruguay, Uruguay – Chair;
Alper Baba – Izmir Institute of Technology, Turkey;
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Cassio Roberto da Silva – CPRM, Geological Survey, Brazil;
Chaosheng Zhang – NUI Galway, Ireland;
Diego Fridman – Director, Research Department, FUNCEI, Buenos Aires, Argentina;
Dra Laura Borgel – Toxicology and Risk Assessment Universidad de Chile Santiago de Chile, Chile;
Eduardo Ferreira da Silva – Universidade de Aveiro/GeoBioTec, Portugal;
Fernando P. Carvalho – IST University of Lisbon, Portugal;
Fetullah Arik – Selçuk University, Konya, Turkey;
Gurhan Yalcin – Akdeniz University, Turkey;
Hassina Mouri – University of Johannesburg, South Africa;
Héctor Rubio – College of Animal Production and Ecology Autonomous University of Chihuahua Chihuahua, México;
Igor Pechenkin – Russian Geological Society, Russia;
Iosif Volfson – Russian Geological Society, Russia;
Jose Centeno – US Food and Drug Administration, United States of America;
Krasimira Staneva – Bulgarian Association on Geomedicine and Geotherapy (BAGG), Bulgaria;
Leonid Rikhvanov -Tomsk Polytechnic University, Russia;
Maria Aurora Armienta – Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México;
Mark Cave – British Geological Survey, Keyworth, Nottingham, United Kingdom;
Natalia Baranovskaya – Tomsk Polytechnic University, Russia;
Nurdane Ilbeily – Akdeniz University, Turkey;
Olle Selinus – Linneus University Kalmar, Sweden;
Prosun Bhattacharya – KTH Royal Institute of Technology, Sweden;
Robert Finkelman – University of Dallas, United States of America;
Robert Walinder – Universtiy of Uppsala, Sweden;
Saverio Fiori – University of Bari, Italy.
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President of ROSGEO, PhD in Economy;

Cochairmen:
Sergey Donskoy
Minister of Ministry of Natural Resources and Environment of the Russian Federation, Russia
Vladimir Zakharov
Head of Scientific and Expert Center of Sustainable Development and Environmental Health, IDB RAS, Doctor of Biological Sciences, Professor, Corresponding Member of the Russian Academy of Sciences;
Dmitry Puscharovsky
Dean of the Faculty of Geology, Moscow State University, Doctor of Geological and Mineralogical Sciences, Professor, Honored Scientist of the Russian Federation;

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1st. Vice-President ROSGEO, PhD in Technical sciences;

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Tyumen State Oil and Gas University;
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Head Scientific Specialist of the Institute Volcanology and Seismology of Russian Academy of Sciences, the Far East branch, Doctor of Physics and Mathematics;
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ROSGEO Bookkeeper Deputy, PhD in Mineralogy;
Irina Lugovskaya
Science Secretary of Fedorovsky VIMS Scientific Research Institute, Moscow, Doctor of Sciences in Geology;

Members of the Organizing Committee:
Victor Trofimov
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Victor Starostin
Head of Petroleum Geology Department, Moscow State University, Doctor of Geological and Mineralogical Sciences, Professor;
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ROSGEO Medical Geology Division Saint-Petersburg branch, Chair, PhD in Medical sciences;
Olga Menchinskaya
ROSGEO Medical Geology Division. Advisor in urban medical geology, PhD in Geology & Geochemistry;
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ROSGEO Medical Geology Division. Advisor in radiogeocology, PhD in Geology;
Alexandr Gulynin
ROSGEO Medical Geology Division. Advisor in veterinary & radiogeocology, PhD in Biological sciences;
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Doctor of Sciences in Geology, Institute of Mineral Resources of Moscow Geological Prospecting University, Director;

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Doctor of Sciences in Geology, Head of the Chair of Mineral Resources and Geochemistry of Radioactive Elements and REE’s at Tomsk Polytechnic University;

Natalya Baranovskaya
Doctor of Sciences in Biology, Head of the Department of Foreign Affairs at Tomsk Polytechnic University;

Olga Frank-Kamenetskaya
Doctor of Sciences in Geology, professor of Geology Department of Saint-Petersburg State University;

Venue Coordinator:
Natalia Usova
Trialogue Ltd.;

Technical Program Coordinators:
Vladimir Gavrilenko
IMGA Chapter NIS, executive committee member, Doctor of Sciences in Geology;

Dmitry Vlasov
Saint-Petersburg Society of Naturalists, President, Doctor of Sciences in Biology;

Julia Plotkina
IMGA Chapter NIS executive committee Member, PhD in Mineralogy;

Short Course (Workshop) Coordinators:
Igor Pechenkin
IMGA Chapter NIS executive committee member, Doctor of Sciences in Geology;

Elena Panova
IMGA Chapter NIS, executive committee member, Doctor of Sciences in Geology;

Vladimir Chelibanov
Saint-Petersburg Society of Naturalists member of the board, OPTEC company, Director, PhD in Chemistry;

Field Trip Coordinators:
Victor Garanin
Director of Fersman Mineralogy Museum of Russian Academy of Sciences, Doctor of Sciences in Geology;

Tatyana Suvorova
Director of Kaliningrad Regional Amber Museum;

Irina Polyakova
Head Scientific Specialist, Kaliningrad Regional Amber Museum, PhD in Philosophy;

Publicity Coordinator:
Alexander Prokin
1st Geological Internet Chanel, Director;

Vadim Kantor
GREENPEACE, photographer, observer.
GENERAL INFORMATION

1. Registration and Information Desk:
   1. The Registration Desk is located at 2nd floor at Topaz Hall
   28 August 2017 from 08:00 till 18:00
   29 August 2017 from 08:00 till 18:00
   30 August 2017 from 08:00 till 18:00
   31 August 2017 from 08:00 till 18:00
   01 September 2017 from 08:00 till 14:00

2. Slides – preview:
   We kindly ask you to submit your presentations IN ADVANCE to a technical specialist at the Registration Desk.

IMPORTANT!!!
   When you create a file in Power Point for your presentation, please make sure that all graphics are included into the presentation file. Fonts should be standard, for example, Times New Roman, Arial or Courier. If you want to use non-standard fonts, they should be included in the presentation file. We also ask you to set the size of the slide “Screen”.

Presentation timings:
   It is extremely important to the success of the event that speakers respect the time schedule. For standard presentations, the allotted time is 15 minutes. Please plan your presentation in a way that it will not exceed the allocated time and will allow some questions within your allotted time.

Equipment for presentation:
   PowerPoint (OS: Windows XP, Russian version; Software: Microsoft PowerPoint 2007) and LCD with a resolution of at least 1024X768 dots per inch. Private computers cannot be allowed to be used for the sessions.
   Each session hall is equipped with PC laptop computer, one data/video projector and one large screen.
   Please provide your presentation on a CD-ROM or USB memory stick (“flash drive”) for a technical expert beforehand. CD-ROMs in Microsoft Windows or USB memory sticks (“USB flash drives”) are accepted. The file name should contain your name. The presentation should be prepared in Microsoft PowerPoint 2003 or 2007.

3. Certificates of Participation:
   Certificates of Participation will be included into the Conference Kit. A certificate about oral/poster presentations will be available upon request.

4. Meals for participants:
   Coffee breaks will be arranged in the Exhibition hall of the Salut Hotel (2nd floor).
   29 August 2017 – 10.00–10.30; 16.00–16.30
   30 August 2017 – 10.30–11.30; 16.30–17.00
   31 August 2017 – 10.30–12.00; 16.30–17.00
   01 September 2017 – 10:30–11:00

5. Exhibition:
   The important component of the event will be the exhibition at which the participants will be able to get acquainted with new scientific results and underlying theoretical approaches.

   If you have any questions, please do not hesitate to contact the Registration Desk during the whole event.

Contacts:
   tel.: + 7 (926) 848-23-58, +7 (919) 760-80-98
   Email: medgeo2017@confreg.org
HOTEL SALUT 4*, MOSCOW

Hotel Salut 4* is located in the South-West of Moscow from airport Vnukovo side and connected with Sheremetyevo and Domodedovo airports by the Moscow Ring Road. Perfect transport connection, closeness to Yugo-Zapadnaya metro station and Vernadskogo and Leninsky prospects, make it easy for the guests to reach any destination within Moscow in a fast and comfortable way. Combination of services meeting any needs of our guests, comfort of living, hotel location and prices make Hotel Salut 4* one of the most popular hotels in Moscow. The whole Hotel Salut 4* staff does the best to meet the demands of the clients by giving good and various services.

Address: 119571, Moscow, Leninskiy prospect, 158

Yugo-Zapadnaya and Troparevo metro stations (15 minutes on foot, the hotel provides a free shuttle to the metro station Yugo-Zapadnaya according to schedule).

Salut Hotel has wide range of bars and restaurants where one can have a tasty dinner and have a good time – starting from haute cuisine restaurant for real gourmets to a traditional café with perfect coffee, light snacks and desserts. Also Salut Hotel has wide opportunities for conducting negotiations, presentations, seminars, conferences and trainings.

HOW TO REACH THE SALUT HOTEL:

From metro station: Troparevo (Sokolnicheskaya Line)
Exit to the Ruzskaya street, further along the underground passage to the side of Leninsky Prospekt (traffic towards the city center), then 900 meters straight forward on foot or by any transport (the second stop is required).

From metro station: Yugo-Zapadnaya (Sokolnicheskaya Line)
The first car from the city center, exit to the left along the underground passage, exit from the metro to the city to the left. On the right side (26, Baku Commissars Street) there is a stop of municipal passenger transport, bus number 720 to the stop "Hotel Salut" (the third stop is required).

From metro station: Leninskiy Prospect (Kaluzhsko-Rizhskaya Line)
The first car from the center, opposite the exit from the metro take the city mini bus number 553 to the stop "Hotel Salut".

From metro station: Oktyabrskaya (Kaluzhsko-Rizhskaya Line)
Exit to the city, to the right of the metro exit take the city bus number 144 (express train) to the stop "Hotel Salut".

FREE SHUTTLE FROM THE SALUT HOTEL (BUS WITH THE HOTEL LOGO)

Working hours: every day from 07.30 to 19.30 (with a break from 13.00 to 14.00.)
Meeting Place: Main Entrance of the Hotel
Route: To Metro Station "Yugo-Zapadnaya".
VENUE PLAN

3 floor

Sapphire Hall
Opening Ceremony

2 floor

Amethyst Hall
Poster Session
Exhibition Area

Topaz Hall
Coffee Break

Emerald Hall

REGISTRATION

ENTRANCE
to the registration, exhibition, poster session
and coffee-break area

Passage to the conference halls through the hotel lobby

WC
## TIMETABLE

### 27 August 2017, Sunday

- **10.00-18.00** Excursions

### 28 August 2017, Monday

- **10.00-17.00** Excursions
- **09.00-18.00**
  - **Workshop: FUNDAMENTALS OF MEDICAL GEOLGY**
  - Jose Centeno, Robert B. Finkelman, Chaosheng Zhang, Saverio Fiore
- **18.00-21.00** City tour (included in the registration fee)

### 29 August 2017, Tuesday

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<tr>
<th>Hall</th>
<th>Amethyst</th>
<th>Hall</th>
<th>Topaz</th>
<th>Hall</th>
<th>Emerald</th>
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<tbody>
<tr>
<td><strong>Chair</strong></td>
<td>Iosif Volfson, Russian Geological Society, ROSGEO, Russia</td>
<td><strong>Chair</strong></td>
<td>Davies Theophilus Clavell, University of Nigeria, Nigeria</td>
<td><strong>Chair</strong></td>
<td>Jose Centeno, US Food and Drug Administration, USA</td>
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### 13.30-14.30 Break

### 14.30-16.00

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<tbody>
<tr>
<td>16.00-16.30</td>
<td>Occupational Health Issues (OH)</td>
<td>16.30-18.00</td>
<td>Environmental Geochemistry (EG)</td>
<td>16.30-18.00</td>
<td>Arsenic and Other Toxianions in the Environment (ATE)</td>
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### 16.30-18.00

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<td><strong>Chair</strong></td>
<td>Diego Fridman, FUNCEI, Argentina</td>
<td><strong>Chair</strong></td>
<td>Syed E Hasan, University of Missouri, USA</td>
<td><strong>Chair</strong></td>
<td>Prosun Bhattacharya, KTH Royal Institute of Technology, Sweden</td>
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<td></td>
<td>Carla Patinha, University of Aveiro, Portugal</td>
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<td>Nelly Manay, University of the Republic (UdelaR), Montevideo-Uruguay</td>
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18.00-21.00 Welcome Reception (included in the registration fee)

### 30 August 2017, Wednesday

<table>
<thead>
<tr>
<th>Time</th>
<th>Venue</th>
<th>Session</th>
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<tbody>
<tr>
<td>09.00-10.30</td>
<td>Amethyst/Topaz</td>
<td>Occupational Health Issues and Medical Problems of Mining Areas (OH)</td>
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<tr>
<td>Chair</td>
<td>Maria Aurora Armienta, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México</td>
<td>Chair Bonotto Daniel Marcos, IGCE-UNESP, Brazil Natalya Baranovskaya, National Research Tomsk Polytechnic University, Russia</td>
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<tr>
<td>10.30-11.30</td>
<td>Amethyst</td>
<td>Poster session, Coffee Break</td>
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<td>Chair</td>
<td>Natalia Baranovskaya, National Research Tomsk Polytechnic University, Russia</td>
<td>Chair</td>
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<tr>
<td>11.30-12.30</td>
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<td>Plenary lecture (PL-03): Africa: A natural laboratory for medical geology investigations Hassina Mouri, University of Johannesburg, Republic of South Africa</td>
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<td>12.30-13.00</td>
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<td>Keynote lecture (KL-06): Environmental health impact of past uranium mining Fernando Carvalho, Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal</td>
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<td>13.00-14.00</td>
<td>Amethyst/Topaz</td>
<td>Soils in Medical Geology and Environmental Geochemistry (S)</td>
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<td>Chair</td>
<td>Hassina Mouri, University of Johannesburg, Republic of South Africa</td>
<td>Chair Fernando Carvalho, Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal Igor Pechenkin, All-Russian Research Institute for Mineral Resources named after N. Fedorovsky, VIMS, Moscow</td>
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<td>14.00-15.00</td>
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<td>Break</td>
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<td>Amethyst</td>
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<td>Chair</td>
<td>Lilit Sahakyan, Center of Environmental and Noospheric Research, National Academy of Sciences, Armenia</td>
<td>Chair Leonid Elpiner, Institute for Water Problems RAS, Moscow, Russia</td>
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<td>16.30-17.00</td>
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<td>Coffee Break</td>
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<td>Soils in Medical Geology and Environmental Geochemistry (S)</td>
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<td>Chair</td>
<td>Gurhan YALCIN, Akdeniz University, Turkey</td>
<td>Chair Fetullah Arik, Selcuk University, Turkey</td>
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<td>18.00-19.30</td>
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<td>IMGA General Assembly and Business Meeting</td>
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<td>18.00-22.00</td>
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<td>City tour (included in the registration fee)</td>
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<tr>
<td>09.00-10.30</td>
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<td>Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)</td>
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<td>Vladimir Gavrilenko, Herzen State Pedagogical University, Saint Petersburg, Russia</td>
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<td>10.30-12.00</td>
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<td>13.00-14.00</td>
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<td>Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)</td>
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<td>Robert Barry Finkelman, University of Texas at Dallas, USA</td>
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<td>14.00-15.00</td>
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<td>15.00-16.30</td>
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<td>Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)</td>
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<td>Cristiana Costa, University of Aveiro, Department of Geosciences, Aveiro, Portugal</td>
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<td>16.30-17.00</td>
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<td>17.00-18.15</td>
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<td>Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)</td>
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<td>Karakaya Çelik Muazzez, Necati Karakaya, Selcuk University, Turkey, El Ghalbi Khalil, University Mohamed Premier, Morocco</td>
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**01 September 2017, Friday**

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<tr>
<th>Time</th>
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<tr>
<td>09.00-10.30</td>
<td></td>
<td>Medical Geology, Public Health and Regulatory Sciences (MG)</td>
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<td>Jose Centeno, US Food and Drug Administration, USA</td>
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<td>Vladimir Zakharov, Head of the Center of Sustainable Development and Environmental Health, Koltzov Institute of Developmental Biology of Russian Academy of Sciences, Moscow, Russia</td>
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<td>13.00-13.30</td>
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<td>Closing Ceremony</td>
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## PROGRAM

### 29 August 2017, Tuesday

<table>
<thead>
<tr>
<th>Hall</th>
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<th>09.00-09.30</th>
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<tr>
<td></td>
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<td>09.30-09.45</td>
<td>Documentary about RosGeo</td>
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<td>09.45-10.00</td>
<td>Surprise for participants</td>
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<td>10.00-10.30</td>
<td>Coffee Break Opening Exhibition</td>
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<tr>
<td>Chair</td>
<td>Davies Theophilus Clavell,</td>
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<td>University of Nigeria, Nigeria</td>
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<td>Vladimir Zakharov, Head of the</td>
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<td>Center of Sustainable Development and Environmental Health, Koltzov Institute of Developmental Biology of Russian Academy of Sciences, Moscow, Russia</td>
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<td>10.30-11.30</td>
<td>PL-01</td>
<td>Jose Centeno, US Food and Drug Administration, USA</td>
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<tr>
<td></td>
<td>Health and Earth - Medical Geology: Building a Safer Environment</td>
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<td>11.30-12.30</td>
<td>PL-02</td>
<td>Yanxin Wang, China University of Geosciences, China</td>
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<td></td>
<td>Geo-statistical Analysis of Urinary Stone Disease Prevalence in China</td>
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<tr>
<th>Hall</th>
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<th>12.30-13.30</th>
<th>Occupational Health Issues (OH)</th>
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<td>Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)</td>
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<td>12.30-13.30</td>
<td>Arsenic and Other Toxianions in the Environment (ATE)</td>
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<tr>
<td>Chair</td>
<td>Iosif Volfson, Russian Geological Society, ROSGEO, Russia</td>
<td>Chair</td>
<td>Davies Theophilus Clavell, University of Nigeria, Nigeria</td>
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<tr>
<td></td>
<td>KL-01</td>
<td>12.30-13.00</td>
<td>Diego Fridman, FUNCEI, Argentina</td>
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<td></td>
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<td></td>
<td>Environmental Epidemiology and Health Effects of Mining in Argentina</td>
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<td>KL-02</td>
<td>12.30-13.00</td>
<td>Syed E Hasan, University of Missouri, USA</td>
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<td>Total Health Initiative and Medical Geology: Need for a Fresh Perspective</td>
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<td>12.30-14.30</td>
<td>KL-03</td>
<td>13.00-13.30</td>
<td>Anatoly V. Skalny, Trace elements in medicine in Russia. Trace Element – Institute for UNESCO, Lyon (France), Moscow (Russia)</td>
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<td>Carlo Patinha, University of Aveiro, Portugal</td>
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<td>Total and Bioaccessible PTEs Levels in Urban Street Dusts from Two Cities of Portugal under Different Anthropogenic Pressures</td>
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<td>KL-04</td>
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<td>Nelly Manay, University of the Republic (UdelaR), Montevideo-Uruguay</td>
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<td>Estimating Low-dose Health Risks from Environmental Arsenic in Uruguayan Populations</td>
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<td>KL-05</td>
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<td>Prosun Bhattacharya, KTH Royal Institute of Technology, Sweden</td>
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<td>Arsenic and Fluoride in Groundwater – Health Problems of Global Concern and Sustainable Mitigation</td>
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<td>UMG-01</td>
<td>ATE-02</td>
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<td>14.30-14.45</td>
<td>Mercury Contamination to the Environment and Health Impacts by Small and Large Scale Hg Mining Activities in China</td>
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<td></td>
<td>Xinbin Feng, Institute of Geochemistry, CAS, China</td>
<td>Distribution and Health Risk Assessment of Hexachlorocyclohexanes (HCHs) in Urban Soils with Various Types of Land Use in Beijing, China</td>
<td>Spatial Distribution and Risk Assessment of As and Metals in Sediment of Kocacay River Impacted by Historical Pb-Zn Mine Wastes</td>
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<td>BALCI Nurgul, Istanbul Technical University, Turkey</td>
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<td>14.45-15.00</td>
<td>Potential Health Effects of Pollution of Soils and Dusts around Metal Recycling Factories in South-western Nigeria</td>
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<td>Akinade Shadrach Olatunji, University of Ibadan, Nigeria</td>
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<td>15.00-15.15</td>
<td>The Impact of Potentially Toxic Elements on the Health Status of Residents Living in Historical Mining Areas, Slovak Republic</td>
<td>Urban Geochemistry of African Megacities</td>
<td>Mercury Isotopes Link the Source and Biomarkers in Human Mercury Exposure</td>
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<td>Rapant Stanislav, State Geological Institute of Dionyz Stur, Slovakia</td>
<td>Davies Theophilus Clavell, University of Nigeria, Nigeria</td>
<td>Li Ping, Institute of Geochemistry, Chinese Academy of Sciences</td>
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<td>Petr Timofeev, Scheltec AG, Moscow, Russia</td>
<td>Yalcin Fusun, Akdeniz University, Turkey</td>
<td>Yang Yijun, China University of Geosciences, China</td>
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<tr>
<td>15.30-15.45</td>
<td>Sarcoïdosis in Terms of Medical Geology</td>
<td>Geochemical Assessment of Fate and nature of Potentially Toxic Elements in Selected Nigerian Cities</td>
<td>Geographic Variation Between Arsenic in Drinking Water and the Occurrence of Chronic Kidney Disease: A Nationwide Population-Based Study in Taiwan</td>
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<td>Olga Denisova, Siberian State Medical University, Russia</td>
<td>Akinade Shadrach Olatunji, University of Ibadan, Nigeria</td>
<td>Guo How-Ran, National Cheng Kung University, Taiwan</td>
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<tr>
<td>15.45-16.00</td>
<td>Chemical Composition of the Placenta Biopsies as an Indicator of Enterprise Technogenic Impact on the Environment</td>
<td>Professor T. G. Ilyina Contribution in Formation of Medical Geology Fundamentals</td>
<td>We Use the Phosphorus and Other Fertilizers. Is It Dangerous?</td>
</tr>
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<td>Alexandra Belyanovskaya, National Research Tomsk Polytechnic University, Russia</td>
<td>Igor Pechenkin, All-Russian Research Institute for Mineral Resourses, Moscow, Russia</td>
<td>Evgeniya Vasilieva, Dmitry Mendeleev University of Chemical Technology of Russia, Russia</td>
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<tr>
<td>16.00-16.30</td>
<td>Coffee Break</td>
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<td>16.30-18.00</td>
<td>Occupational Health Issues (OH)</td>
<td>Olga Denisova, Siberian State Medical University, Russia</td>
<td>Farah Fuad Mahmudova, Institute of Geology and Geophysics, National Academy of Sciences, Republic of Azerbaijan</td>
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<tr>
<td>16.30-18.00</td>
<td>Environmental Geochemistry (EG)</td>
<td>Nelly Monay, University of the Republic (UdelaR), Montevideo-Uruguay</td>
<td>ATE-07 Bromine in the Environment and its Impact on Human Health</td>
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<tr>
<td>16.30-16.45</td>
<td>OH-06</td>
<td>Haiyan Chen, Chinese Academy of Sciences, China</td>
<td>Soil Carbonate Minerals and Food Safety: A Field Investigation from the Yangtze River Delta, China Li-Wei, Nanjing University, China</td>
</tr>
<tr>
<td>16.30-16.45</td>
<td>EG-01</td>
<td>Figuereido Bernardino Ribeiro, University of Campinas, Brazil</td>
<td>ATE-08 Arsenic in Groundwater of Dagestan Republic</td>
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<tr>
<td>16.30-16.45</td>
<td>ATE-07</td>
<td>Tatyana Perminova, University of Technology of Troyes, France</td>
<td>Dagestan Scientific Center of the Russian Academy of Science, Russia</td>
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<tr>
<td>16.45-17.00</td>
<td>OH-07</td>
<td>Iskhak Farkhadutdinov, Bashkir State University, Russia</td>
<td>The Impact of Geological Factors on Prevalence of Type 2 Diabetes in the Republic of Bashkortostan</td>
</tr>
<tr>
<td>16.45-17.00</td>
<td>EG-02</td>
<td>Figureresco, Li-Wei, Nanjing University, China</td>
<td>Mercury in Amazon Rainforest Soils, Brazil</td>
</tr>
<tr>
<td>16.45-17.00</td>
<td>ATE-09</td>
<td>Tatiana Kosinova, Voronezh State University, Russia</td>
<td>The main directions of the environmental justification for the development of Elans and Jolkinskis copper-nickel deposits</td>
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<tr>
<td>17.00-17.15</td>
<td>OH-08</td>
<td>Shields Rahje Jared, University of the West Indies, Jamaica</td>
<td>The potential Environmental &amp; Health Implications from Bauxite Tailings Dust: a Pilot Study in Jamaica</td>
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<td>17.00-17.15</td>
<td>EG-03</td>
<td>Tatiana Zubkova, Lomonosov Moscow State University, Russia</td>
<td>Sanitary Functions of Soil</td>
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<tr>
<td>17.00-17.15</td>
<td>ATE-10</td>
<td>Irina Kosinova, Dagestan Scientific Center of the Russian Academy of Science, Russia</td>
<td>The main directions of the environmental justification for the development of Elans and Jolkinskis copper-nickel deposits</td>
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<tr>
<td>17.15-17.30</td>
<td>OH-09</td>
<td>Aminuddin, Geological Agency of the Ministry of Energy and Mineral Resources, Indonesia</td>
<td>Problems Using Mercury In Local Mining, Pasaman District Of Indonesia</td>
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<tr>
<td>17.15-17.30</td>
<td>EG-04</td>
<td>Cásio Roberto da Silva, CPRM - Geological Survey of Brazil, Brazil</td>
<td>Distribution of Germanium in Soils in the Southeast and Part of the Northeast of Brazil and its Importance for Human Health</td>
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<td>17.15-17.30</td>
<td>ATE-11</td>
<td>Fetullah Arik, Selcuk University, Russia</td>
<td>Interconnections of Chemical Composition of Anthropogenic Carbonates and Human Health Data</td>
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<td>17.30-17.40</td>
<td>OH-10</td>
<td>Martin Walter, University of Vienna, Austria</td>
<td>To the Proposal of Medical Geology Research on the Territory of Kamchatka Peninsula</td>
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<td>17.30-17.40</td>
<td>EG-05</td>
<td>Arif Delikan, Selcuk University, Turkey</td>
<td>Heavy Metal Distribution of Stream Sediments in Gürkuyu Sb Mineralization (Gediz-Kütahya, NW Turkey)</td>
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<td>17.30-17.40</td>
<td>ATE-12</td>
<td>Fetullah Arik, Selcuk University, Turkey</td>
<td>Drinking Water (Ground and Surface), Iron Overload and Liver Pathology</td>
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<td>17.45-18.00</td>
<td>OH-11</td>
<td>Abdeldayem Raafat, Egypt</td>
<td>Localizing Crystal-sites of Long-term Radical Formation in Weathered Chrysotile Asbestos</td>
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<td>17.45-18.00</td>
<td>EG-07</td>
<td>Fetullah Arik, Selcuk University, Turkey</td>
<td>Heavy metal distribution in the southern Meram region (Konya-Turkey), which is a newly urbanization area</td>
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<td>18.00-21.00</td>
<td>Welcome Reception (included in the registration fee)</td>
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<td>09.00-10.30</td>
<td>Amethyst</td>
<td>Occupational Health Issues and Medical Problems of Mining Areas (MA)</td>
<td>Maria Aurora Armienta, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México</td>
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<tr>
<td>09.00-10.30</td>
<td>Topaz</td>
<td>Radioactivity, Radio Geoecology and Human Health (RRG)</td>
<td>Bonotto Daniel Marcos, IGCE-UNESP, Brazil</td>
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<td>09.00-09.15</td>
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<td>MA-01 Spatial Distribution and Risk Assessment of As and Metals in Sediment of Kocacay River Impacted by Historical Pb-Zn Mine Wastes</td>
<td>Balci Nurgul, Istanbul Technical University, Turkey</td>
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<tr>
<td>09.00-09.15</td>
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<td>RRG-01 High Natural Radioactivity in the Soils as a Reason of Radioecological Problems</td>
<td>Anastasia Zlobina, National Research Tomsk Polytechnic University, Russia</td>
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<td>09.15-09.30</td>
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<td>MA-02 Uptake of metal(loid)s by Cabbage (Brassica olerácea L.) and chemical risk of consumption in contaminated soils from tungsten mines in Portugal</td>
<td>Paula Freire Ávila, National Laboratory of Energy and Geology, Portugal</td>
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<td>RRG-02 Mineralogical and Geochemical Composition of Human Body Ash Residue as Reflection of Environmental Factors</td>
<td>Maria Deriglazova, National Research Tomsk Polytechnic University, Russia</td>
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<td>MA-03 Impact of Heavy Metals Contamination by Artisanal Gold Mining at Jatiroto Village, Wonogiri District, Central Java, Indonesia on Stream Sediment</td>
<td>Budianta Wawan, Gadjah Mada University, Indonesia</td>
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<td>RRG-03 Anomalous Concentrations of Radionuclides in Groundwater of Ede Area, Southwestern Nigeria: a Direct Impact of Metamictization?</td>
<td>Dr. A. Adetunji, Obafemi Awolowo University, Nigeria</td>
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<td>MA-04 Population Morbidity Due to Liquidation of Coal Deposits in Ukraine</td>
<td>Georgii Rudko, State Commission of Ukraine for Mineral Reserves, Ukraine</td>
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<td>09.45-10.00</td>
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<td>RRG-04 Areas with a High Content of Radioactive Elements and Some Medico-biological Problems in These Areas</td>
<td>Leonid Rikhvanov, National Research Tomsk Polytechnic University, Russia</td>
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<td>10.00-10.15</td>
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<td>MA-05 Molecular, Isotopic and Genetic Composition of Human Gallstones: A Geomedical Study</td>
<td>Kose - Sureyya, Curtin University, Australia</td>
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<td>10.00-10.15</td>
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<td>RRG-05 Determination of Natural Radio Active Element Concentration in the Terra-Rosa of Minim-Martap District Area</td>
<td>Yalcin Mustafa Gurhan, Akdeniz University, Turkey</td>
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<td>10.15-10.30</td>
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<td>MA-06 Volcanic Gas-ash Interaction: an in Vitro Study of Respiratory Health Hazard</td>
<td>Tomášek Ines, Durham University, Great Britain</td>
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<td>10.15-10.30</td>
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<td>RRG-06 Which Environmental Factor Is Correlated with the Long-term Multiple Sclerosis Incidence Trends: Ultra-Violet B Radiation or Geomagnetic Disturbance?</td>
<td>Sajedi Seyed Aidin, Golestan University of Medical Sciences, Iran</td>
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<td>10.30-11.30</td>
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<td>Poster session, Coffee Break</td>
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<td>PL-03 Africa: A natural laboratory for medical geology investigations</td>
<td>Hassina Mouri, University of Johannesburg, Republic of South Africa</td>
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<td><strong>KL-06</strong> Environmental health impact of past uranium mining</td>
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<td>Fernando Carvalho, Laboratory of Radiation Protection and Safety Institute Superior Técnico, Tecnológico e Nuclear Campus, Lisboa, Portugal</td>
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<td><strong>Soils in Medical Geology and Environmental Geochemistry (S)</strong></td>
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<td><strong>Hassina Mouri, University of Johannesburg, Republic of South Africa</strong></td>
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<td><strong>Olle Selinus (Skype), Linneus University Kalmar, Sweden</strong></td>
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<td><strong>KL-07</strong> Soils in Medical Geology and Environmental Geochemistry</td>
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<td><strong>Maria Aurora Armienta, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México</strong></td>
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<td><strong>KL-08</strong> Medical Geology and Arsenic in México; an Overview</td>
<td>13.30-14.00</td>
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<td><strong>Maria Aurora Armienta, Geophysics Institute Universidad Nacional Autónoma de México Mexico City, México</strong></td>
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<td>14.00-15.00</td>
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<td>15.00-16.30</td>
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<td><strong>Soils in Medical Geology and Environmental Geochemistry (S)</strong></td>
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<td><strong>Lilit Sahakyan, Center of Environmental and Noospheric Research, National Academy of Sciences, Armenia</strong></td>
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<td>15.00-15.15</td>
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<td><strong>S-01</strong> Geochemistry and the Life of Human Society</td>
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<td><strong>Vladimir Gavrilenko, A. Herzen Russian State Pedagogical University, Russia</strong></td>
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<td>15.15-15.30</td>
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<td><strong>S-02</strong> Factors Controlling the Potential of Arsenic of Soils within Konya Settlement</td>
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<td><strong>Horasan Bilgehan Yabgu, Turkey</strong></td>
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<td>15.30-16.00</td>
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<td><strong>KL-12</strong> Assesment of natural molasses soil in terms of Medical Geology</td>
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<td><strong>Gurhan YALCIN, Nurdane ILBEYLI, Akdeniz University, Turkey</strong></td>
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<td>16.00-16.15</td>
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<td><strong>S-03</strong> Geochemical Assessment Of Heavy Metals In Wetland Sediments From Around Maryland Area of Lagos, Southwestern Nigeria Omotunde Victoria Bolaji, African University of Life and Earth Sciences (Including Health and Agriculture), Nigeria</td>
<td>16.00-16.15</td>
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<td><strong>Alena Drazdova, Republican unitary enterprise «Scientific practical center of Hygiene», Minsk, Belarus</strong></td>
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<td>16.15-16.30</td>
<td>S-04 Impact of Fly ash Disposal on Soil and Groundwater Quality in Parts of Central Ganga Plain, India: A case Study</td>
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<td>Azim Uddin Mirza, Akdeniz University, Turkey</td>
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<td>WHH-02 Hydrogeochemical Characteristics of Groundwater in Mentes Watershed and Environmental Impacts (Yahyal- Kayseri-Turkey)</td>
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<td>Muhterem Demiroğlu, Istanbul Technical University, Turkey</td>
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<td>Soils in Medical Geology and Environmental Geochemistry (S)</td>
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<td>17.00-17.15</td>
<td>S-05 Accumulation of Heavy Metals (Ni, Cu, Cd, Cr, Pb, Zn, Fe) in the Soil, Water and Vegetables Collected from Migori Gold Mines Vicinity, Kenya</td>
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<td>Veronica Ngure, Laikipia University, Kenya</td>
<td>17.00-17.15</td>
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<td>17.15-17.30</td>
<td>S-06 Importance of Humic Acid for the Diversity of Microorganisms Involved in the Biodegradation of Pentachlorophenol in Soils</td>
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<td>Tong Hui, Institute of Geochemistry, Chinese Academy of Sciences, China</td>
<td>17.15-17.30</td>
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<td>17.30-17.45</td>
<td>S-08 Plant Uptake of Au in Agricultural Soils Amended with Au Nanoparticles or HAuCl4: Role of Soil Geochemistry</td>
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<td>Rodrigues - Sonia - Morais, University of Aveiro, Portugal</td>
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<td>WHH-03 Geological Environment and Groundwater Quality, a Key to Social Development: the Binomial Southern Edge of the Duero Basin Spanish Central System, Spain</td>
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<td>Giménez-Forcada Elena, Instituto Geológico Minero de España (IGME), Spain</td>
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<tr>
<td>18.00-19.30</td>
<td>IMGA Conference</td>
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<td>18.00-22.00</td>
<td>City tour (included in the registration fee)</td>
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<td>09.00-10.30</td>
<td>Urban Medical Geology: Integrating Geologic and Anthropogenic Processes (UMG)</td>
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<td>Vladimir Gavrilenko, Herzen State Pedagogical University, Saint Petersburg, Russia</td>
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<td>WHH-07 Exposure to Lead and Cadmium Via Private Drinking Wells in Scania, Sweden</td>
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<td>Larsson Estelle, Lund University, Sweden</td>
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31 August 2017, Thursday

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<tr>
<th>Time</th>
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<tr>
<td>09.00-10.30</td>
<td>Oral Bioaccessibility of Potentially Toxic Elements (PTEs) in Urban Area of Belfast</td>
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<td>Tatiana Cocerva, Queen’s University Belfast, Great Britain</td>
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<td>09.40-10.00</td>
<td>UMG-07 Mineralogy of Human Kidney Stones</td>
<td>Alina Izatulina, Saint-Petersburg State University, Russia</td>
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<td>WHH-08 Impact of Deficit Contents of Calcium and Magnesium in Groundwater/Drinking Water on Health Status of Inhabitants, Slovak Republic</td>
<td>Veronika Cveckova, State Geological Institute of Dionyz Stur, Slovakia</td>
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<td>10.00-10.20</td>
<td>UMG-08 Characterization of Solid Airborne Particles in Industrialized Cities – a Case Study of Western Siberia (Russia)</td>
<td>Anna Talovskaya, National Research Tomsk Polytechnic University, Russia</td>
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<td>WHH-09 Recharge History and Provenance of Salinity in the Aquifer Systems of Yuncheng Basin, Northern China</td>
<td>Li Chengcheng, University of Toronto, Canada</td>
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<tr>
<td>10.20-10.30</td>
<td>Discussion</td>
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<td>10.30-12.00</td>
<td>Poster session, Coffee Break</td>
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<tr>
<td>12.00-13.00</td>
<td>Plenary lecture (PL-04): Finkelman Robert Barry, University of Texas at Dallas, USA</td>
<td>Finkelman Robert Barry, University of Texas at Dallas, USA</td>
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<td>Health Benefits of Geologic Materials and Geologic Process</td>
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<tr>
<td>13.00-14.00</td>
<td>Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)</td>
<td>Robert Barry Finkelman, University of Texas at Dallas, USA</td>
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<td>Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)</td>
<td>Iosif Volfson, Russian Geological Society, ROSGEO, Russia</td>
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<td>13.00-13.30</td>
<td>KL-14 Medical Geology and its Role in Brownfield Site Evaluation and Development: When Wealth Generation of the Past Impacts Prosperity of the Future</td>
<td>Dowling Kim, Federation University, Australia</td>
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<td>KL-15 Mathematical Modelling of Biospheric Regulation of the Carbon Cycle in Central Asia in the Conditions of Global Climate Change</td>
<td>Anna Kurbatova, RUDN University, Russia</td>
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<td>13.30-14.00</td>
<td>Health of the environment: methodology and practice of evaluation</td>
<td>Vladimir Zakharov, Center of Sustainable Development and Environmental Health</td>
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<td>KL-16 Spatial variation in soil geochemistry at regional, field and micro scales: New opportunities and challenges</td>
<td>Chaosheng Zhang, National University of Ireland</td>
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<td>14.00-15.00</td>
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<tr>
<td>15.00-16.30</td>
<td>Mineral and Hydromineral Healing Resources. Historical and Modern Aspects of Their Use in Medical Practice (MHHR)</td>
<td>Cristina Costa, University of Aveiro, Department of Geosciences, Aveiro, Portugal</td>
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<td>Modern Techniques for Investigation and Monitoring of Environment Condition and Human Health (MT)</td>
<td>Chaosheng Zhang, National University of Ireland, Ireland</td>
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<td>15.15-15.30</td>
<td>MHHR-01 Hydrochemical and Health Evaluation of the Thermal and Mineralized Waters in Gazligöl (Afyon)</td>
<td>Güler Gökçmez, Selçuk University, Turkey</td>
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<td>MT-01 Application of Solid State NMR at Mineral/ Water Interface: A Molecular Level Investigation of Fluoride Removal by Nano-sized Hydroxyapatite</td>
<td>Li-Wei, Nanjing University, China</td>
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<td>15.30-15.45</td>
<td>MHHR-02 Arsenic Biogeochemistry in Hot Springs in Tengchong Geothermal Area, China</td>
<td>Ping Li, China University of Geosciences, China</td>
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<td>MT-02 Hardware and Software for Seismic Radon Station Srs-05</td>
<td>Boris Belashev, Institute of Geology of the Karelian Research Center of the Russian Academy of Sciences, Russia</td>
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<td>15.45-16.00</td>
<td>Therapeutic Mineral Waters of the Republic of Tatarstan. Settlement and Spread Patterns, Problems of Their Use Rafail Ibragimov, Tatneft, Russia</td>
<td>Multivariate Data Analysis of Specimens Containing Silica Fume Yalcin Fusun, Akdeniz University, Turkey</td>
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<td>16.00-16.15</td>
<td>The Use of Minerals in Arab-Islamic Medieval Medicine: Examples from “The Canon of Medicine” by Ibn Sina (11th Century) El Ghalbi Khalilaf, University Mohamed Premier, Morocco</td>
<td>Removal of Thallium from Aqueous Solutions Using Fe-Mn Binary Oxides Li - Huosheng, Guangzhou University, China</td>
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<td>17.30-17.45</td>
<td>Hydrothermal in Situ Maturation of Clayey Geomaterials (Azores, Portugal): Assessment of Their Properties for Pelotherapy Rocha Fernando, University of Aveiro, Portugal</td>
<td>The Spatiotemporal Analysis of Thermal Comfort and Public Health in Urban Centers of Russia Natalia Shartova, Lomonosov Moscow State University, Russia</td>
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<td>17.45-18.00</td>
<td>Study of Historical and Contemporary Aspects for Medical Use of Talaya Health Resort Water Resources in Russian Cultural Educational Foundation named after V.A. Tsaregradsky Dmitrii V. Vorobev Department of Medical Geology Russian Cultural Educational Foundation of V.A. Tsaregradski (RCEF ), LLC «The doctor Vorobev medical innovation centre», Russia</td>
<td>Microorganisms Isolated from Permafrost as Facilities for the Development of New Drugs Sergei Petrov, Tyumen Scientific Center of the Siberian Branch of the Russian Academy of Sciences, Russia</td>
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<td>18.00-18.15</td>
<td>Chemical Composition and Suitability of Some Turkish Thermal Muds Used as Peloids Karakaya Çelik Muazzaz, Necati Karakaya, Selcuk University, Turkey</td>
<td>Mineralogical, Geochemical and Technological Characterization of Clayey Commercial Cosmetic Products Carla Marina Bastos, University of Aveiro, Portugal</td>
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<td>Karakaya Çelik Muazzaz, Necati Karakaya, Selcuk University, Turkey, El Ghalbi Khalilaf, University Mohamed Premier, Morocco</td>
<td>Rodrigues - Sonia - Morais, University of Aveiro, Portugal</td>
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<tr>
<td>17.15-17.30</td>
<td>Residual Smectitic Clays from Santiago (Cape Verde): Assessment of Their Properties as Healing and Geopagic Materials Angela Cerqueira, University of Aveiro, Portugal</td>
<td>The Spatiotemporal Analysis of Thermal Comfort and Public Health in Urban Centers of Russia Natalia Shartova, Lomonosov Moscow State University, Russia</td>
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<td>Chemical Composition and Suitability of Some Turkish Thermal Muds Used as Peloids Karakaya Çelik Muazzaz, Necati Karakaya, Selcuk University, Turkey</td>
<td>Prospects of Application of Geoinformational Systems for Veterinary Geology Vladislav Belimenko, All-Russian Scientific Research Institute of Experimental Veterinary Sciences named after Ya.R. Kovalenko, Russia</td>
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<tr>
<td>09.00-10.30</td>
<td>Medical Geology, Public Health and Regulatory Sciences (MG)</td>
<td><strong>Chair</strong>&lt;br&gt;<strong>Jose Centeno</strong>, US Food and Drug Administration, USA&lt;br&gt;<strong>Vladimir Zakharov</strong>, Center of Sustainable Development and Environmental Health IBD RAS, Moscow, Russia</td>
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<tr>
<td>09.00-09.15</td>
<td>MG-01</td>
<td>How to Promote Medical Geology in Developing Countries. Challenges, Achievements and Success in Uruguay</td>
<td>Nelly Mañay, University of the Republic (UdelaR), Montevideo-Uruguay</td>
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<td>09.15-09.30</td>
<td>MG-02</td>
<td>Environmental Geochemistry and Human Health: General and Regional Aspects (in Russian Federation and Crimean Region)</td>
<td>Elena Evstafeva, Crimea Federal University, Russia</td>
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<tr>
<td>09.30-09.45</td>
<td>MG-03</td>
<td>Hydrocarbon Sphere and Some Diseases Associated with It</td>
<td>Yuri Galant, Israel</td>
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<tr>
<td>09.45-10.00</td>
<td>MG-04</td>
<td>Medical Geology Investigation in Indonesia</td>
<td>Andiani, Geology Agency, Indonesia</td>
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<td>10.15-10.30</td>
<td>MG-06</td>
<td>Exploratory Study Between Renal and Genotoxic Damage in Costa Rican Children with Respect to Geographic Location in the Mesoamerican Nephropathy</td>
<td>Montero-Campos Virginia, Institute of Technology Costa Rican, Costa-Rica</td>
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<td>10:30-11:00</td>
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<td>11:00-11:15</td>
<td>MG-07</td>
<td>Open-Cut Mining: Its Devastating Socio-Environmental Effects on Comunitary Health</td>
<td>Campa Uranga Maria Fernanda, Universidad Autónoma de la Ciudad de México, Mexico</td>
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<td>11:15-11:30</td>
<td>MG-08</td>
<td>Effect of Waste-Dump Sites on the Sustainability of the Water Resource Environment in Gbarain-Niger Delta Catchment of Nigeria</td>
<td>Egitrani Davidson Enoni, Niger Delta University, Nigeria</td>
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<td>11:30-11:45</td>
<td>MG-09</td>
<td>We Use Phosphorus and Other Fertilizers. Is it Dangerous?</td>
<td>Vasileva Evgeniya Grigor’evna</td>
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<td>11:45-12:00</td>
<td>MG-10</td>
<td>Modeling of Regularities of Geodynamic and Geosocial Processes</td>
<td>Anna Dolgaya, Institute of volcanoology and seismology FEB RAS, Russia</td>
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<td>12:00-12:15</td>
<td>MG-11</td>
<td>The Current State of Medical Geology Investigations in Azerbaijan</td>
<td>Farah Fuad Mahmudova, Institute of Geology and Geophysics, Azerbaijan</td>
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<tr>
<td>12:15-12:30</td>
<td>MG-12</td>
<td>Geo-spatial Impact on Public Health in the Coastal Region of West Bengal, Eastern India: an Appraisal on Medical Geology</td>
<td>Acharya Tapas Hooghly, Mohsin College, (University of Burdwan), India</td>
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<tr>
<td>12:30-12:45</td>
<td>MG-13</td>
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<td>Vladimir Chelibanov, Department of Environmental Instrument-Making and Monitoring ITMO University, Saint Petersburg, Russia</td>
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Circulation: 4500 copies

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The popular science magazine published by the Department of Natural Resources and Environmental Protection of the city Moscow. Themes: econews, the first faces of the urban ecology, ecoprojects and discussions, the history of the Moscow ecosystems, citizens about environmental issues, scientific developments in the ecosphere, travel, etc.
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MINERAL MINING & CONSERVATION,
A scientific, technical and methodological journal

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A scientific, technical and methodological journal it addressing a wide range of aspects of underground resource management, including such issues as legal and regulatory frameworks and methodological support, economic strategy and innovation-driven development of the Russian mining industries. The Journal provides detailed coverage of efficient and comprehensive development of mineral deposits, high-level processing and conversion of minerals, development and application of novel geotechnologies and equipment, and industrial safety; discusses the environmental aspects of underground resource management; presents the analytics on mineral reserves and resources, mineral markets, and keeps the readership informed on the important industry events.

PROSPECT AND PROTECTION OF MINERAL RESOURCES

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www.rion-journal.com

Periodical journal has been published from 1931 to the present day. It highlights the actual problems of geology. The journal was awarded the honorary signs and gratitude letters. «Prospect and protection of mineral resources» is a multidisciplinary scientific-and-technical journal that brings together all the geological institutions of the country. Firstly it was published in July 1931 in Moscow and it has been one of the basic geology journals. On the pages you can observe boards of the Federal Agency of Natural resources of Russia, from time to time selections on various aspects of mineral resources of the country, new methods and technologies of exploration. The main subjects are the details about new deposits of solid minerals, materials, techniques and technology for exploration, articles on management and economics of geological exploration, conservation of resources, professional life and other issues.
THE RARE EARTH MAGAZINE

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The Rare Earth’ magazine is a major strategic project aimed at strengthening Russia’s position in the international media space in regards to industry and the REM (rare earth and rare metals) sector. ‘The Rare Earth’ is focused on developments in high-tech industries which are of critical importance to the following spheres:

• aviation
• space
• mechanical engineering
• shipbuilding
• the nuclear industry
• electronics and other areas

The project describes the current state of the rare-earth industry and presents analyses, forecasts and statistics, plus publishes interviews with experts and key figures in the industry.

RUSSIAN GEOLOGICAL SOCIETY (ROSGEO)

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www.rosgeo.org

The Russian Geological Society (ROSGEO) is a non-profit organization that brings together over 2500 individual members in many regions of Russia, 52 regional offices, Interdepartmental Council for Museum Activity, Central Council for Youth Geological Movement.

The main objective of ROSGEO is uniting the efforts of geologists to increase countries mineral and raw resources, contributing to the geological science, protecting the rights of specialists.

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SOCIAL PROGRAM

MOSCOW KREMLIN AND CATHEDRALS

Date: 28.08.2017 and 30.08.2017
Price: 68 EUR*/ 4800 RUR
* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.
Please, rely on the price given in RUR.
Time: 10:00–15:00
Duration: 5 hours
Meeting point: Lobby of the Salut Hotel
The price includes:

- English-speaking guide;
- transport (bus);
- entrance tickets.

Stroll around the territory of the Kremlin and appreciate its fantastic sights such as the Assumption Cathedral which held the ceremonies of Tsars and Emperors as well as the symbolic Ivan the Great Bell Tower. You’ll walk past the famous Tsar Bell and Tsar Cannon before visiting the world famous museum treasury which holds a collection of ancient state insignia, gold and silver utensils, religious robes, weapons, luxury carriages as well as all the attire of famous Tsars from over the years. Occupying a beautifully old building from the middle of the 19th Century, this treasury offers you a glimpse of the glories and heroism of Russia’s past, whilst you can leisurely appreciate the sights on foot.
MOSCOW CITY TOUR

Date: 28.08.2017
Price: 23 EUR*/ 1600 RUR
* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.
Please, rely on the price given in RUR.
Time: 10:00–15:00
Duration: 5 hours
Meeting point: Lobby of the Salut Hotel

The price includes:
- English-speaking guide;
- transport (bus).

Visit the beautiful sites of Moscow with this fully guided tour of the city. You will see the most famous sites as well as the most historic foundations. Make your way around Red Square with scenes of glorious architecture with St. Basil’s Cathedral, the Lenin Mausoleum and State Historical Museum. Then continue along the peaceful Moskva River embankment as you take in the breath-taking views of the Kremlin before you reach the Cathedral of Christ the Saviour, New Maiden’s Convent and Moscow State University.

The tour doesn’t stop there as you get taken to Sparrow Hills’ observation spot to see Moscow at its finest with a spectacular panoramic view. Travel on through the Memorial Complex at Poklonnaya Hill and Victory Park, Triumphal Arch, Kutuzov Avenue, New Arbat, Boulevard Ring, Pushkin Square, Tverskaya Street before finishing this grand tour at Manezhnaya Square. Full of sights and culture, this tour is the perfect way to see all the wonders of the city of Moscow.

CITY TOUR AT NIGHT

Date: 28.08.2017 and 30.08.2017

PRICE FOR THE CONFERENCE PARTICIPANTS: INCLUDED INTO THE REGISTRATION FEE/ IF YOU WISH TO ATTEND THIS TOUR, PLEASE ACCESS YOUR PERSONAL ACCOUNT AND ORDER IT FOR A NECESSARY DATE

Price for guests: 28 EUR*/ 2000 RUR
* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.
Please, rely on the price given in RUR.
Time: 18:00–21:00

Duration: 3 hours
Meeting point: Lobby of the Salut Hotel

The price includes:
- English-speaking guide;
- transport (bus).
See the bright lights of Moscow at night with this guided evening tour. You will be taken along the vibrant lit streets with several photo opportunities along the way. Experience the nighttime atmosphere in the historic city centre and see the beautiful architecture from the famous Sparrow Hills, offering astonishing panoramic views.

You will be able to see Moscow’s nightlife with bars, clubs and restaurants. You will not miss the famous sites either with haunting views of Red Square as well as the architecture of the Cathedral of Christ the Saviour and the Peter the Great Monument. Finally, experience the gorgeous moonlit view of the Sophia embankment on this exciting nighttime tour of the city. See more of what Moscow has to offer by seeing its buildings come to life at night.

GALA-DINNER AT THE BOAT «CHIZHIK-2»

Date: 31.08.17
Time: 19:00
Duration: 5 hours
Price: 60 EUR/ 4200 RUR

The boat “Chizhik-2” is a sample of opulent surroundings, ergonomic layout of decks and interior spaces.

We believe that river air, good atmosphere, magnificent views over the heart of the Russian capital and great cuisine will make the participants’ and guests’ evening an unforgettable one. You are invited to enjoy an excellent dinner and informal interaction with the colleagues.

BOAT TRIP ON MOSCOW RIVER BY HISTORICAL CENTER

Date: 01.09.2017
Price: 48 EUR*/ 3400 RUR
* Price in EUR is approximate and based on the rate 1 EUR = 70 RUR.
Please, rely on the price given in RUR.
Time: 15:30 – 20:30
Duration: 5 hours
Meeting point: Lobby of the Salut Hotel
The price includes:
- English-speaking guide;
- transport (bus and boat);
- entrance tickets.

This tour is perfect to see the incredible sights of Moscow. Sail down the ancient transport route of the Moskva River and get away from the streets of the city. You will see all of the sights, whilst experiencing the beautiful currents of the river beneath you. From the ship’s deck you’ll be able to spot the Kremlin, The Cathedral of Christ the Saviour, the Monument to Peter the Great, House of Artist, Moscow State University and the New Maiden Convent. You will not miss anything on this fantastic river cruise in the sparkling Russian sunshine.
PL-01 MEDICAL GEOLOGY – IMPACTS OF THE NATURAL ENVIRONMENT ON HUMAN HEALTH

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In the last few decades, there has been a growing awareness that some natural environmental changes occur on a scale that affects global ecologies: atmospheric, hydrogeological, and food production systems worldwide have been transformed in ways that sometimes leads to the emergence (and/or re-emergence) of health problems in humans and animals. Although it has been recognized that natural geological factors play key roles in a range of environmental health issues that impact the health and well-being of billions of people worldwide, there is a general lack of understanding of the importance of these factors on human and animal health among the general public, the biomedical/public health community and the geosciences/environmental community.

Medical geology – the science that deals with the impacts of natural geologic materials and processes on animal and human health attempts to bridge this gap by increasing the awareness of these issues between the geoscientist, environmental and biomedical communities, and by stimulating increased research collaboration among these disciplines. Medical geologists are a group of scientists that are primarily interested in outbreaks of disease in which the characteristics of the local geological constituents contribute to the occurrence of various disease states. For the most part, diseases of interest have often included the effects of deficiency or toxicity of a variety of metallic elements on various systemic organs. Scientists have studied the long-term effects of exposure to inorganic elements, the most prominent example being arsenic. Thus, medical geology may be considered as a complementary discipline to the established field of environmental health focusing on how the natural environment impacts health. These impacts, both deleterious and beneficial, have been known for millennia but it is just in the last decade that scientists interested in these phenomena have begun to organize local, regional and global collaborations in this emerging discipline of medical geology.

Medical geologists are scientists (geochemists, biomedical/public health professionals, chemists, toxicologists, epidemiologists, hydrologists, geographers, etc.) who generally collaborate on a wide range of environmental health problems seeking causes and solutions. Among these problems are the health impacts of geogenic (natural) dusts, naturally occurring elements in surface water, ground water and soil, geologic processes such as volcanoes, erosion, earthquakes, tsunamis, etc., occupational exposure to natural materials and natural radiation. Many medical geology studies have been focused on the health impacts of dust from various origins. Medical geologists study the source, occurrence, distribution, concentration, chemistry, crystallinity and morphology of minerals (such as asbestos, erionite, silica, pyrite) that may cause health problems. Medical geologists try to determine the sources, transport and fate of potentially harmful trace elements such as arsenic, fluoride, selenium, copper and other metals. They try to determine the pathways of exposure and produce maps that illustrate local, regional and/or global geologic and geochemical factors and their relationship to existing or potential health problems. In this presentation, we will discuss the global impact of medical geology and provide a new perspective about its future.

Disclaimer: The views, opinions, and assertions expressed herein are those of the author and do not reflect the official policy or position of the U.S. Food and Drug Administration and the U.S. Government. Citation of commercial organizations or trade names in this presentation does not constitute an official endorsement by the U.S. Food and Drug Administration or U.S. Government.

PL-02 GEO-STATISTICAL ANALYSIS OF URINARY STONE DISEASE PREVALENCE IN CHINA

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Urinary stone disease (USD) has afflicted mankind for millennia and continues to be a significant medical ailment throughout the world. Although an upward trend for USD prevalence is reported in almost every country, it varies significantly among different countries and regions. A global USD belt (Snow Belt) was identified, stretching from Canada, southeastern North America, Iceland, Portugal, Spain, German, Italy, Tunisia, Greece, Turkey, Egypt, Sudan, Saudi Arabia, the United Arab Emirates, Iran, Pakistan, India, Myanmar, southern China, southern Japan, Thailand, and Indonesia to the Philippines. The distinctive geographical distribution attracts the attention of geoscientists to study the influence of geogenic factors on geographical clustering of USD. Among all the factors, the relationship between USD prevalence and water hardness has been under debate. The inconsistency in understanding the effect of water hardness might be attributed to the inhibitory effect of some ions in hard water that usually has a high content of calcium favorable for lithogenesis and a high magnesium content as well which reduces the risk of stone formation. Most epidemiological studies up till now have been focused on the total hardness, but ignored the effect of Mg²⁺. We proposed to use Ca²⁺/Mg²⁺ ratio as an indicator to reflect the combined effect of Ca²⁺ and Mg²⁺ on USD occurrence. In China, the increase of Ca²⁺/Mg²⁺ ratio (in mg/l) in drinking water was found to promote stone formation in the urinary system.

The predominant urinary stone composition is a mixture of calcium oxalate and phosphates. We found that the spatial distribution of phosphate-type stones is closely related to that of phosphate ore deposits and carbonate rocks. Besides, hot or warm climate and seasons increase the risk of lithogenesis through high average air temperature. Soil environment influence the composition of food, thus affecting stone formation in the urinary system. Therefore, USD could be endemic, with geogenic factors playing critical roles in USD etiology. Choosing China as a typical area, we developed a statistical risk assessment model to predict USD prevalence in China using Weight-Of-Evidence method (WOFE). WOFE is a quantitative data driven method based on the Bayesian probability theory. Four geogenic proxies were considered in the model, including Ca²⁺/Mg²⁺ ratio, the spatial distribution of phosphate ore deposits, the carbonate rocks distribution, and the average air temperature. The verified WOFE model was then used to estimate the probability of USD prevalence. The modeling results are significant for ameliorating health risks and reducing the prevalence and incidence of USD.

Acknowledgments. This study was supported by the National Natural Science Foundation of China (No.41521001).

PL-03 AFRICA: A NATURAL LABORATORY FOR MEDICAL GEOLOGY INVESTIGATIONS

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Medical Geology has seen an important development in the world since it was established. However, in Africa such a field is still not yet well developed although it is in Africa that the application of research would be most relevant. The African continent is characterized by a very complex and dynamic geological history including frequent earthquakes, volcanic activities in tectonically active regions, pervasive dust, water toxicity due to interaction with the geological environment etc. etc. All these naturally occurring processes and materials could have short and/or long term impact on human and animal health. The situation on the African continent can be aggravated by the fact that most of the population relies solely on groundwater and locally produced food grown from soil that can be either enriched in toxic elements or deficient from essential elements for healthy plants growth. Therefore, considering the significance of a number of serious health issues, which are prominent on the continent and for which the causes are still not well understood or not known, and which could possibly be related to the naturally occurring geological issues, we consider Africa a natural laboratory for investigations on possible links between the geology and such health issues. This would lead to broadening our understanding of the diagnostic spectrum as well as therapy for many geological related health issues and thus improve life quality on the African continent especially in rural areas. The presentation will highlight some examples of naturally occurring geological process and materials, which might be the cause of a number of health issues occurring in Africa such as some types of cancer, thyroid issues, cardiovascular diseases, asthma, fluorosis, silicosis, etc.

PL-04 HEALTH BENEFITS OF GEOLOGIC MATERIALS AND GEOLOGIC PROCESS

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The field of Medical Geology is concerned with the impacts of geologic materials and geologic processes on animal and human health. Most medical geology research has been focused on health problems caused by excess or deficiency of trace elements, exposure to ambient dust, and on other geologically related health problems or health problems for which geoscience tools, techniques, or databases could be applied. Little, if any, attention has been focused on the beneficial health effects of rocks, minerals, and geologic processes. These beneficial effects may have been recognized as long as two million years ago and include emotional, mental, and physical health benefits. Some of the earliest known medicines were derived from rocks and minerals. For hundreds of years various clays have been used as an antidote for poisons. “Terra sigillata,” still in use today, may have been the first patented medicine. Many trace elements, rocks, and minerals are used today in a wide variety of pharmaceuticals and health care products. There is also a segment of society that believes in the curative and preventative properties of crystals (talisman and amulets). Metals and trace elements are being used in some of today’s most sophisticated medical applications. Other recent examples of beneficial effects of geologic materials and processes include epidemiological studies in Japan that have identified a wide range of health problems (such as muscle and joint pain, hemorrhoids, burns, gout, etc.) that may be treated by one or more of nine chemically distinct types of hot springs, and a study in China indicating that residential coal combustion may be mobilizing sufficient iodine to prevent iodine deficiency disease.
MINING has accompanied and made possible the development of civilization. In addition, min-
ing companies generally handle environmental aspects with care. However, like other industrial
activities, mining has made serious mistakes in the past and may also make some in the future, if ad-
equate control measures are not implemented. A serious case in Argentina involved the lead smelter
Metal Huasi, which operated between 1955 and 1987 in the city of Alta Pampa, Jujuy, where it pro-
cessed minerals from the mine Puquiatas. After its closure, more than 15 tons of heavy metal waste
remained accumulated at the site, of which at least 7 tons have high concentrations of lead. Because
of the presence of such toxic waste in the city, the health and environmental conditions of the inhab-
itants of Alta Pampa—most of which belong to the Kolla indigenous people—have been negatively
affected. Naturally, this and other precedents have raised concern in the Argentinean community
on the environmental pollution that may result from mining, an industry that has grown steadily in
the country. Nowadays, Bajo de la Alumbra is the largest copper open-pit mine. It operates since 1997
and is in the northwestern province of Catamarca. Given the controversy aroused by the potential
health hazards associated with the open-cast mining, we conducted a study to evaluate the
potential health hazards associated with the opencast mining, we conducted a study to evaluate
the effects of this activity on the health conditions of people who work in or live near Bajo de la Alum-
bra. The project was the result of a cooperation agreement between FUNCEI (Fundación Centro
de Estudios Infectológicos), a non-profit organization, and the Ministry of Health of Catamarca.
We found no evidence that mining had adverse health effects on the local communities. Another
example is Veladero mine (the largest gold mine in Argentina), located in San Juan, that in 2016 had
a fresh cyanide spill, with no proven impacts on the health of the community. To better understand
how exposure to environmental factors in mining areas impact health, appropriate surveillance
measures should be undertaken, according to the local needs. Health impact assessment is a frame-
work which combines different procedures, methods and tools to evaluate the potential effects of
economic activities on the susceptible populations, and makes recommendations regarding the mit-
igation measures. Before the launching of large-scale mining projects, health impact assessment
provides useful information and helps stakeholders, local communities and government authorities
make evidence-based decisions about mining activities. Mining development is fundamental to the
progress of our civilization, but it must remain in harmony with the environment. Finally, the role of
the expert in public health should be prioritized, in the impact assessment, communication of risks,
and relationships with the community.

In this work the potentially toxic elements (PTEs) levels and its oral bioaccessibility in urb-
an street dust samples collected in two nearby Portuguese cities were determined. Under similar
gеochemical features the two cities (Estarreja and Aveiro) located in the central coast of Portugal
differ in the type of anthropogenic pressures. Estarreja, with a greater influence of industry and ag-
aricultural activities, has an area of 20.2 km², and about 7500 inhabitants. In this city is located one
of the biggest chemical industrial pole of the country, which left an environmental contamination
legacy, resulting from more than 85 years of industrial production. This represents a constraint
for the agricultural practices (a very important activity in the region) and a risk to human health.
About 20 km away from Estarreja is located Aveiro, with an area of 45.32 km², and a population
of 18,756. Although the ceramic industry, the production and processing of metals and pulp and
paper industry are the main industrial activities of the municipality of Aveiro, in the city the main
anthropogenic pressures are associated with traffic and building construction.
In both cities, the sampling was conducted in the urban areas: in Estarreja about 4 km² and
in Aveiro 3 km². The results showed that levels of Cr, Ni, Fe, and Pb are quite similar between
cities, whereas high levels of Zn and Mn were found in Estarreja, while Co and As is higher in Aveiro.
Anyway, a high intra-city variability of PTEs contents is observed in both cases. The oral
bioaccessibility data is also very variable between PTEs and intra-city.

**KL-04**

**ESTIMATING LOW-DOSE HEALTH RISKS FROM ENVIRONMENTAL ARSENIC IN URUGUAYAN POPULATIONS**

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Medical Geology is a developing discipline in Uruguay since 2005 and arsenic (As) exposure health
risks is its major area of research. Geogenic As in groundwater surveillance is recently con-
ducted in Uruguay and different aquifers of the country have As levels above those recommended
by the WHO for drinking water (10 μg/L). The access to safe drinking water averages more than 90%
per cent population of the whole country and the service is given by the state drinking water supplier
(OSE) with a As maximum allowable limit value of 20 μg/L and a target value of 10 μg/L. The in-
ternational recommendations and As regulations in Argentina are also based on the same standard.
In spite of all these regulations, there is a lack of baseline studies of general population and workers exposure to
non-occupational sources of arsenic, and there are no epidemiological studies in regards to As
environmental exposure to prevent long-term health effects exposures to low doses of As. The aim of
this work is to present the ongoing studies of environmental health impacts of low doses of arsenic
in Uruguayan populations, and the relationships to their biomarkers (As in urine and hair) among
other variables. The reviewed studies are mainly from research projects of postgraduate
students. After validating the analytical methodologies for toxicologically relevant species in urine
and hair, small scale pilot studies on children, adults and workers populations are being evaluated
in relation with different parameters that can be linked to biological levels of arsenic. Preliminary
results represent the first data emerging from Uruguayan populations that could be used as a source
for an estimation of low-dose health risks from As in the country/conclusion, arsenic is a natural
and ubiquitous element throughout the environment so it is very difficult to protect populations
against low-level exposure of As. The evidence for low-dose effects is still controversial worldwide
so the risk of diabetes heart disease, immunological problems, and cancer could be increased. Then,
it is very important that Uruguay can have this kind of scientific studies as background data to take
preventive health actions.

**KL-05**

**ARSENIC AND FLUORIDE IN GROUNDWATER – HEALTH PROBLEMS OF GLOBAL CONCERN AND SUSTAINABLE MITIGATION**

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KTH International Groundwater Arsenic Research Group,
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KTH Royal Institute of Technology, Stockholm

Inorganic contaminants such as arsenic (As) and fluoride (F-) are detected ubiquitously in
the groundwater resources across the globe. Both these elements lead to adverse health impacts
following long-term ingestion and hence are of concern from public health perspective. Both As as
well as F are mobilized in groundwater from the aquifers through the interaction of groundwater
with the constituent solid phases in the aquifers through a number of geochemical triggers under
natural geochemical environments. Groundwater basins of wide aerial coverage in regions located
in Southeast Asia, Africa and Latin America are more vulnerable where groundwater as drinking
water sources among a vast majority of population especially in the rural settings. According to
recent estimates, more than 130 million people worldwide potentially are exposed to As at levels
above the World Health Organization (WHO) drinking water guideline value of 10 μg/L. Ground-
water enriched in fluoride is a widespread problem, and endemic fluorosis is documented from at
least 25 countries around the world, and is most prevalent in India, parts of Africa and China affect-
ing a population of several millions where drinking water fluoride concentrations exceed the WHO
guideline value of 1.5 mg/L. While As is a proven carcinogen and has a number of carcinogenic and
non-carcinogenic effects on human health, fluoride content in drinking water is considered essential
below the guideline value. Excessive fluoride has a detrimental effect on human health as excessive

**KEYNOTE LECTURES**

**KL-02**

**TOTAL HEALTH INITIATIVE AND MEDICAL GEOLOGY: NEED FOR A FRESH PERSPECTIVE**

Syed E. Hasnan
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Recent initiatives by the World Health Organization, the US National Science Foundation,
and the US Environmental Protection Agency, have introduced a new paradigm in human health
care by including the non-medical factors. This came about in recognition of the fact that occur-
rence of a disease is not due solely to medical factors but embodies interplay among a number
of other factors; and, while genetics and lifestyle predispose an individual to certain disease, the infl-
Uence of other contributing factors, such as the characteristics of natural and built environment, and
social and economic attributes, also play a critical role in health and well-being of an individual or a
population. While medical geology focuses on geological processes and materials and their impacts
on human and ecological health, it is suggested that the scope and definition of medical geology
be expanded to include socio-economic and public policy aspects. I also propose adoption of the
term geohealth to replace medical geology—a term that is all inclusive, has a wider scope, elegantly
incorporates medical geography, and fits in very well with the total health concept. Details of the
initiatives are included in the presentation, along with discussion of the influence of socio-economic
factors and public policies on individual’s or community’s health outcomes. A new definition for the
speciality is proposed, and arguments are put forth to highlight the advantages of replacing medical
geology by geohealth.

**KL-03**

**TOTAL AND BIOACCESSIBLE PTE LEVELS IN URBAN STREET DUSTS FROM TWO CITIES OF PORTUGAL UNDER DIFFERENT ANTHROPOGENIC PRESSURES**

Carla Patinha, N. Durães, Ana Dias, Eduardo Ferreira da Silva
University of Aveiro, Campus de Santiago, Portugal

Urban street dust is a complex mixture consisting of suspended particles (aerosols), and displaced soil and biogenic materials of low grain size fraction, which can be easily mobilised and easily inhaled/ingested by people.
floride can lead to dental and skeletal fluorosis, manifested through teeth mottling, calcification of ligaments and long-term exposure leading to crippling bone deformations and cancers.

At a global scale, systematic pattern has been observed for the occurrence of the aquifers with elevated levels of As in groundwater, mostly parts of the sedimentary basins deposited in these foreland basins as an effect of crustal evolution in orogenic belts. The mobilization of As in groundwater, is triggered under favorable biogeochemical conditions through a water–rock interactions. The distribution of fluoride is predominantly controlled by water-rock interactions especially in rocks such as granite, amphibolites, pegmatites rich in minerals such as muscovite, biotite, hornblende. The areas traversed by acid volcanic rocks, basic dikes and hornblende gneisses contribute to fluoride-rich soils and solubility in groundwater.

Understanding the geochemical processes leading to the mobilization of the contaminants is a primary requisite for understanding the heterogeneity in the concentrations at both regional and local scales. Community education for strengthening public awareness and the involvement and capacity building of local stakeholders in testing the groundwater quality is important for targeting the safe aquifers for drinking water supplies.

KL-06 ENVIRONMENTAL HEALTH IMPACT OF PAST URANIUM MINING
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Uranium mining generated in many countries large amounts of radioactive waste that allowed the buildup of a radioactive waste legacy and environmental impacts. A radioactive environmental impact assessment was carried out in the areas of two large mines, Quinto do Bispo mine and Curinha Baxa mine, and their common drainage basin of Ribeira do Castelo, in the district of Viseu, Portugal. Analysis of radionuclides were carried out in soils, surface water, groundwater, and horticulture and animal products from the region and compared with radionuclide concentrations in samples from other regions. The dispersal of radionuclides such as uranium, radium, thorium, radioactive lead and polonium from uranium milling tailings and acid mine drainage was documented in several environmental materials. A radiological environmental risk assessment was carried out and the transfer of radionuclides with water and diet to humans was considered likely to exceed the effective radiation dose limit of 1 mSv per year adopted for members of the public in individuals of the local population. Environmental remediation measures were introduced to confine radioactive waste and abate the radiation exposure. The environmental remediation is discussed in the light of radiation protection of the population, of the environment and geo-ethics.

KL-07 SOILS IN MEDICAL GEOLOGY AND ENVIRONMENTAL GEOCHEMISTRY
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Soil is not only a part of the ecosystem but also occupies a basic role for humans because the survival of man is tied to the maintenance of its productivity. Soil functions as a filtering, buffering, storage, and transformation system protect against the effects of trace element pollu- tion. Soil is effective in these functions only as long as it has capacity for cation exchange and its biological activity are preserved. The frequent association of trace element pollution with acid deposition greatly complicates the overall effects in the environment.

Soil is the main source of trace elements for plants both as micronutrients and as pol- lutants. It is also a direct source of these elements to humans due to soil ingestion affected by "pica-soil", geophagia, dust inhalation, and absorption through skin.

The soil-plant transfer of trace elements is a part of chemical element cycling in nature. It is a very complex process governed by several factors, both natural and affected by humans. Thus, the prediction of trace element uptake by plants from a given growth medium should be based on several biotic and abiotic parameters that control their behavior in soil.

Soils contain trace elements of various origins: lithogenic – inherited from the lithosphere (parent material), pedogenic – from lithogenic sources but forms changed due to soil-forming processes, and anthropogenic – elements deposited onto and/or into soils as results of human activities. Soil processes and anthropogenic factors control the behavior of all these elements. It has been assumed that the behavior of trace elements in soils and in consequence their phytotoxicity depend on the availability to plants, their transferability to plants is significantly higher than those of natural origin.

Soils of several regions of the world have been and will be in the future subjected to min- eral fertilization, pesticide application, waste disposal and industrial pollution. All these human activities affect both chemical and physical soil properties and will lead to changes in the behavior of trace elements in soils. The impact of soil acidification, alkalization, salinity and losses of soil organic matter on the uptake of trace elements by vegetation, particularly by crop plants, have already become serious issues for the environment and for human health.

Medical geology is among other things dealing very much with soils and health. Several important topics will be covered which in most cases are possible fields of research. Among these are the use of medicinal clays, the global health issue of acid sulphate soils, the important links between agriculture and medical geology, geophagia, children and polluted spoils in play gardens, dust and health, metals in soils. Also the important issue of bioavailability, bioaccessibility, geosolvency etc will be discussed.

KL-08 MEDICAL GEOLOGY AND ARSENIC IN MÉXICO: AN OVERVIEW
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The geological diversity of Mexico including mineralized zones, different rock types and geo- logical formations, active volcanoes, geothermal zones, and tectonic processes, favor the release of arsenic and other potentially toxic elements to the environment. Groundwater being the main drinking potable water source is enriched in arsenic in many areas like Zimapán and Guanajuato in Central Mexico, and Comarca Lagunera and Oihuitzhuas North of the country. Natural and anthropo- gogenic arsenic sources co-exist in some of these zones. Health effects resulting from As contam- inated water consumption like black-foot disease, hypertension and diabetes have been identified in inhabitants of some locations. Besides co-occurrence of high levels of fluoride in many aquifers worsens the health threat. This has been revealed by the correlation between As and fluoride in wa- ter, and As in urine and/or hair and water in those and other areas like Sonora, northwestern Mexico. Specific sources and geochemical processes releasing arsenic and fluoride should be identified to develop adequate measures to protect the population. Successful actions have been put in place in specific areas reducing the exposure. However, this is still not the case at all places. In mineralized zones, polluted soil by mining activities is another As exposure source that must be considered as a potential health problem. In this work an overall picture of As sources and health effects revealed by studies carried out by diverse research groups in Mexico will be presented.

KL-09 GROSS ALPHA AND BETA ACTIVITIES IN GROUNDWATERS FROM SPAS OF SOUTHEAST BRAZIL
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Gross alpha and beta activities have been characterized in 75 water sources from spas located in 14 municipalities in São Paulo and Minas Gerais states, Brazil. These wa- ters are extensively utilized for drinking in public places, bottling and bathing purposes, among other uses. The water samples were taken from springs and pumped tubular wells drilled into different aquifer systems in the Paraná and Southeastern Shield hydrogeo- logical provinces. The gross beta radioactivity ranged 0.08 – 5.22 Bq.L and it was log- normally distributed, whereas the gross alpha levels were between 0.0 and 428 mBq.L. Several water sources exhibited gross beta activities higher than the guidance level of 1 Bq.L established by WHO in 2011. Doses were estimated from ingestion in them of the natural radionuclides 232U, 238U, 234Th, 226Ra, 210Pb, 210Po, and 228Ra, yielding many values exceeding the WHO guidance level of 0.1 mSv/yr. Significant correlations were found between the dose values and gross alpha and beta activities (Fig. 1). The high radioactivity levels in the water sources are related to the accentuated presence of radionuclides in various rock-forming minerals. Therefore, most of them cannot be considered potable as exhibit radiological constraints according to the WHO guidelines.

KL-10 HETEROGENEITY OF THE GEOCHEMICAL PARAMETERS OF NATURAL ENVIRONMENTS IN TOMSK REGION AND MANIFESTATION OF CERTAIN TYPES OF DISEASES
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Tomsk region, the area of which is equal to France or taken together Slovakia, Czech Republic, Belgium, Austria and Ireland, in geological terms it lies at the junction of two major structures: Western Siberian Plate and Altai-Sayan fold area. Large resources of iron ore, oil and gas, peat, mineral waters are located within the plate complex, while gold, antimony, mercury, polymetallic and other ores' deposits are known in the fold area. It has been assumed that the behavior of trace elements in soils and in consequence their phytoavailability differ as to their origin. Regardless of the forms of the anthropogenic trace pollutants, their availability to plants is significantly higher than those of natural origin.

The soil-forming processes will be covered which in most cases are possible fields of research. Among these are the use of medicinal clays, the global health issue of acid sulphate soils, the important links between agriculture and medical geology, geophagia, children and polluted spoils in play gardens, dust and health, metals in soils. Also the important issue of bioavailability, bioaccessibility, geosolvency etc will be discussed.

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These geological features determine the specificity of geophysical fields, the structure and composition of the surface and underground hydrosphere and other regional environmental parameters. Redundancy of Fe, Mn, and the lack of F, I are the hydrogeochemical features of the region’s waters.

In addition to natural factors, anthropogenic factors, caused by the extraction and processing of hydrocarbons, the operation of the nuclear fuel cycle, transboundary transport from industrial regions of southern Siberia (Kuznetsk, Novosibirsk industrial areas), also contribute to the environmental geochemistry of the region. The mass flow of pollutants into the environment occurs in the last 70 years.

Comprehensive eco-geochemical studies of different natural environments – soil and snow cover, lakes bottom sediments, drinking water salt deposits, biota (peat, lichens, terrestrial and aquatic plants, tree rings, etc.), as well as the biological substrates of human and certain types of pets (hair, tissues and organs) are carried out for a long time in the region. This allowed us to carry out zoning of the region and its separate territories.

Simultaneously, the study of several human diseases is conducted in the region, especially diseases of the endocrine system and a specific human disease of unknown etiology called sarcoidosis. According to the results, regional unevenness of sarcoidosis and diseases of the endocrine system prevalence is noted due to eco-geochemical factors.

At the local level, we noted a direct correlation of a number of studied cytogenetic biomarkers (microclinides in blood cells, chromosome aberration) and indicators of the human immune system with the maximum level of chemical elements accumulation in various natural environments.

We also reported an increase of arthritis level associated with changes in the total hardness of drinking water. This became particularly evident when moving river drinking water (soft water) to the underground one (very hard water) in Tomsk city. The doctors of Tomsk city is actively studying the impact of microbiological (nanobacterial) factor in the drinking water on the development of various pathologies in humans (gout and other diseases).

KL-11

EFFECT OF GEOGENIC FACTORS ON GROUNDWATER QUALITY AND ITS RELATION TO HUMAN HEALTH: CASE STUDY: TURKEY

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The geology of an area is a major factor in the overall quality of water and soil resources. The dissolution of numerous minerals from geological formations results in spatial and temporal variations in water quality and consequently influences human health. These interactions are mostly responsible for a variety of health concerns such as cancers of internal organs, Alzheimer’s disease, nephrolithiasis, fluorosis, thyroid goiter problems and skin diseases.

Based on the tectonic characteristics and the geological structure, many parts of Turkey are likely to have high heavy metals such as arsenic, boron, fluoride-containing geological formations. Most of these geological formations are hydrothermally altered and fractured, due complex geology with active tectonics and high geothermal potential. The problems of water quality have become more serious than the quantity nowadays in Turkey, which includes geogenic factors. Geogenic contaminations are mostly in volcanic regions due to arsenic and manganese in different parts of Turkey. Geothermal fluids contain high boron and fluoride levels especially in the graben areas of western Turkey. Geothermal fluids which contain fluoride poses a danger for skeleton, dental, and bone problems, especially in the areas of Denizli, Isparta, and Aydın. Arsenic levels up to 4% have been observed in mineral deposits, particularly in the Kütahya-Emet region, which is known to contain the world’s largest boron deposits. High arsenic concentrations in groundwater have been detected in many provinces of Turkey with values ranging from 10 to 9300 ppb in groundwater.

Some public health survey conducted in northwest of Turkey revealed that some local people have been affected from high heavy metals such as aluminum and arsenic containing water sources coming from densely altered rocks. These results also indicate that geological formation can have considerable impact on human health when high lead levels in individuals living in close proximity to ore mining areas and volcanic alteration sites are taken into consideration.

KL-12

ASSESSMENT OF NATURAL MOLASSES SOIL IN TERMS OF MEDICAL GEOLOGY

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Molasses is obtained with the crushing of either sweet fruts (e.g., grape, fig, carob, mulberry) or agricultural products that turning into sugar (e.g. sugar beet, juniper fruit). It is an intense and sweet syrup that is unique to Anatolia. Clay or soils are used extensively in the making of molasses thus these natural materials are called molasses soil. The material used as molasses soil is a white and whitish in color which contains 50-90% CaCO₃. The clay minerals are, in general, kaolinite, smectite, illite and mica.

As in every soil type, chemical pollution caused by environmental influences can be encountered in molasses soil as well. It is, particularly, important to determine heavy metal, naphthalene, pesticide contents in the soil and also to define the areas in which they can have a toxic effect. As long as these contaminants are not controlled, they can pass to molasses easily during its production. Therefore the risk of exposure to soil-related pollutants is particularly high in molasses.

Within this research, the Nigde and Denizli regions from Turkey in where molasses is produced intensively. In the samples of molasses from Nigde Province, residue levels of some kinds of pesticides and the presence of polycyclic aromatic hydrocarbons were defined. The lithological exposures of some areas in the north of Denizli have been investigated and it has been concluded that some of the molasses used may contain heavy metal contents. In this context, the use of molasses in these areas could result health problems.

KL-13

MEDICAL HYDROGEOLOGY AS A NEW BRANCH OF MEDICAL GEOLOGY

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The knowledge of the role of water factor in global processes of environmental influence on human living conditions and their health determines the creation of medical ecological concepts. The report is designed as backgrounds for a new scientific field of medical geology – medical hydrogeology.

The use of groundwater for household water supply increases dramatically as a consequence of surface water sources quality deterioration. Unfortunately, the great concept of high water quality of groundwater sources and their safety has been changed in last decades – it now includes not only anthropogenic pollution but also natural water contamination. Russian and international works show high range of causes of groundwater pollution related to the complex of ecological, legal, technological and economic problems. Medical ecological assessment of contemporary data on dynamics and character of changes of groundwater quality is based on a number of thorough epidemiological and ecological-toxicological studies in recent decades. The analysis of the data shows the increase of non-infectious and infectious diseases as a result of the use of groundwater of poor quality.

Large-scale investigations that use modern methodologies of risk assessment present new information on negative influence of natural composition and anthropogenic pollution on human health. Cause-and-effect relationships of the pathology under study – particularly, oncology and cardio-vascular diseases – with high content of particular groundwater microelements of natural genesis, toxic organic substances (including high danger ones – e.g. dioxins), heavy metals have been established. Studies of the problem show the significance of any part of modern hydrogeology – science on origins, content, conditions of location, peculiarities of movements, and interrelationships of groundwater with enclosing rocks, – for safe groundwater supply. Interdisciplinary approach for complex use of forecasting techniques of hygiene, ecological toxicology, epidemiology, hydrochemistry, hydrogeology, sanitation, geoeconomics is necessary to solve the complex of emerging problems. The use of the approach for water management problems related to groundwater use will help researchers to make a right choice of groundwater reserves’ replenishment, safety of sanitary protection, techniques of water quality amelioration, and desalination. Therefore, there is the necessity for views and information exchange among specialists on forms and nature of collaboration when making a choice of water management decision with regard to medical ecological interests. The approach needs the creation of special guidelines for researchers and managers.

Introduction of medical hydrogeology basics as a separate discipline for preventive medicine and water management specialists will increase a priority of human health protection when choosing and using groundwater as drinking water source.

KL-14

MEDICAL GEOLOGY AND ITS ROLE IN BROWNFIELD SITE EVALUATION AND DEVELOPMENT: WHEN WEALTH GENERATION OF THE PAST IMPACTS PROSPERITY OF THE FUTURE

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Brownfield sites embody large areas of previously used land and water that may contain sources of hazardous substances or contaminants. Medical geological principles must be used to evaluate the health risks posed by these sites; risks which may be either exacerbated or ameliorated as a result of redevelopment or inaction.

Brownfield sites across the globe represent a complex and evolving problem for land-use planners, developers, environmental regulators, public health authorities and for the public, with many reported examples of disadvantaged communities being subjected to poor health outcomes after redevelopment. Poorly disclosed or defined liability where companies, governments or individuals’ dispute responsibility, combined with an inconsistent global legislative framework are key contributors to poor health and environmental outcomes. In an expanding global community where the development of brownfield sites presents an alluring opportunity to improve land value by reusing this “poor value”
land, it is imperative we adopt consist procedures to mitigate risk and improve environmental and hence potentially human health outcomes. Without a systematic approach to the understanding of brownfield sites contamination, their redevelopment risks impacting on whole-of-population health outcomes in the next century.

We investigate the Goldfields region of Victoria as an example of the complexity of jurisdictions, health returns, and resilience to illustrate the need for holistic and globally contextualised rehabilitation and redevelopment strategies. We present data to illustrate this complexity and the issues associated with inaction.

**KL-15**

**MATHEMATICAL MODELLING OF BIOSPHERIC REGULATION OF THE CARBON CYCLE IN CENTRAL ASIA IN THE CONDITIONS OF GLOBAL CLIMATE CHANGE**

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Both climate and the environment changes in Central Asia are primarily related to desertification. Areas of Central Asia, including Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Afghanistan, belong to the “rare forested” areas. In recent decades, the Central Asian region has experienced a significant warming that led to violations of the hydrological cycle, as well as changes in ecosystem functions of plant communities. The data on the seasonal dynamics of carbon in desert and semi-desert of plant communities in Central Asia were insufficient in recent years. Existing studies tend to overestimate the content of carbon in dry land ecosystems. The deserts and semi-deserts of Central Asia are relatively large, dynamic, and still poorly quantified carbon pools that are likely to play an important role in the global and regional climate change. The degradation of natural resources, including land, fresh and marine waters, forests and biodiversity threatens the lives of many people. An abundant environmental function is manifested through the processes of decomposition and recycling of nutrients, purification and filtering of air and water. When the load exceeds the allowable, the system’s ability to perform these functions is reduced.

This threatens human health due to the consumption of water from contaminated sources, inhalation of air pollution and agrochemical pollution. Actual measurements and laboratory experiments cannot function without the mathematical modelling of the carbon cycle, in the sense that a lot remains unclear to this day. Mathematical models allow us to reduce the data of different measurements in a single three-dimensional model and determine how these changes correspond with some existing concepts and theories. Only global models allow us to carry out computational experiments, forecasts of various development options. The authors use this singular mathematical model of global carbon dioxide cycle in the biosphere with a spatial partition of land and ocean.

To study the regional impacts of global warming and land use in Central Asia, the authors calculated the change of phytomass, humus and the total amount of carbon under the influence of industrial emissions of CO₂, tropical deforestation and erosion of humus associated with unsustainable land management. The calculations were made for the period of 1860-2080 on a spatial model of the global carbon cycle Computing Centre of RAS.

**KL-16**

**SPATIAL VARIATION IN SOIL GEOCHEMISTRY AT REGIONAL, FIELD AND MICRO SCALES: NEW OPPORTUNITIES AND CHALLENGES**

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This presentation discusses the latest understanding of spatial variation in soil geochemistry at various scales, the uses of advanced spatial analysis techniques to quantify the variation, as well as the new challenges which go beyond academic research. Spatial variation in soil geochemistry have been found at all the scales of regional (in square kilometers), field and micro scales (in square centimeters). The techniques of local statistics, hotspot analysis and spatial correlation are explained and applied to soil geochemistry. One of the focuses is the use of local index of spatial association (LISA) and its applications in urban geochemical studies in Galway, Ireland and London, the UK. The LISA is a useful tool for identifying pollution hotspots and classifying them into spatial clusters and spatial outliers. The results were affected by the definition of weight function, data transformation and existence of extreme values. It is suggested that all these influencing factors should be considered until reasonable and reliable results are obtained. The new opportunities have arisen from the current concept of “big data”, but the challenges for stronger “data analytics” are emerging. While the assumptions for the use of parametric statistical methods are widely known, attention is needed for the requirement of spatial autocorrelation when spatial distribution maps are produced based on spatial interpolation. Furthermore, when the geochemical study results are actually applied in environmental management and agricultural practices, political and socio-economic factors are playing an important role, going far beyond academic research.
Impact of potentially toxic elements (PTE) on the health status of population of the Slovak Republic has been studied in two historical mining areas with ore extraction from Middle Ages (the Middle Slovak Neovolcanics, the Slovak Ore Mts.) and one historical mining area with more than hundred years brown coal mining (Upper Nitra region). The contents of PTE were analysed in groundwater/drinking water and soils. The health status of resident population was evaluated based on 43 health indicators classified according to the international classification of diseases (ICD, 10th revision), including mainly those indicators characterizing mortality on cardiovascular and oncological diseases. In these areas the health status of population living in municipalities with increased PTE contents (As, Pb, Zn, Cu, Cd, Hg and Sb) was compared with that in adjacent municipalities showing low PTE contents. A total of 138 contaminated and 153 non-contaminated municipalities were selected. Based on the assessment of the health status of population using 43 health indicators, no significant difference in the health status of population in contaminated and non-contaminated municipalities has been reported. Based on the statistical analysis (Pearson, Spearman) and calculations of artificial neural networks no significant relationship between values of 43 health indicators and PTE contents was documented. We can conclude that if groundwater used for drinking purposes show no PTE contamination, the local population inhabiting these historical mining areas might be at much lower risk than has been, in general, reported so far.

The adverse health impacts of cadmium (Cd), fluorine (F) and molybdenum (Mo) have been received high environmental concerns, however, little was known for Mo’s impact in the endemic fluorosis region. Our research reported for the first time that the geological original Mo might be a serious hidden toxin in the coal combustion endemic fluorosis areas. A case study revealed the enrichment of Mo in a fluorosis-affected rural area in the Three Gorges region, SW China. The concentrations of Mo were 0.6–309 mg kg⁻¹ in stone coals, 8.2–17.9 mg kg⁻¹ in coal balls, 4.8–170.5 mg kg⁻¹ in gangues, 2.6–72.2 mg kg⁻¹ in arable soils and 0.3–46.8 mg kg⁻¹ in local food crops, respectively. It is notable that Mo in urines of local residents was 376.8 ug L⁻¹, much higher than the controls. The pH values in Mo-rich arable soils were 5.4 ± 1.0, indicating high bioavailable fraction of Mo in these soils, which might be a serious hidden toxin in the coal combustion endemic fluorosis areas.

As a marker of Mo exposure, we determined concentrations of Mo in blood, bone, urine and lung samples of exposed individuals. The correlation of Mo contents in bone, blood and lung samples with Mo contents in food, soil, and dust aerosols was found to be significant. The results showed that Mo levels in local residents were much higher than those in the control group, which are consistent with the enrichment of Mo in the coal combustion endemic fluorosis areas. The adverse health impacts of cadmium (Cd), fluorine (F) and molybdenum (Mo) have been received high environmental concerns, however, little was known for Mo’s impact in the endemic fluorosis region. Our research reported for the first time that the geological original Mo might be a serious hidden toxin in the coal combustion endemic fluorosis areas. A case study revealed the enrichment of Mo in a fluorosis-affected rural area in the Three Gorges region, SW China. The concentrations of Mo were 0.6–309 mg kg⁻¹ in stone coals, 8.2–17.9 mg kg⁻¹ in coal balls, 4.8–170.5 mg kg⁻¹ in gangues, 2.6–72.2 mg kg⁻¹ in arable soils and 0.3–46.8 mg kg⁻¹ in local food crops, respectively. It is notable that Mo in urines of local residents was 376.8 ug L⁻¹, much higher than the controls. The pH values in Mo-rich arable soils were 5.4 ± 1.0, indicating high bioavailable fraction of Mo in these soils, which might be a serious hidden toxin in the coal combustion endemic fluorosis areas.

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OH-07
THE IMPACT OF GEOLOGICAL FACTORS ON PREVALENCE OF TYPE 2 DIABETES IN THE REPUBLIC OF BASHKORTOSTAN
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The Geological Agency of the Ministry of Energy and Mineral Resources has been research of mercury pollution in mining and medical geology since 2010. The spread of mercury due to gold mining has occurred, especially of local mining in Pasaman District. Samples were taken from hair, urine, plants, and fish as well as health data and analyzed for the mercury content. Interviews were taken with the 20 respondents that the hair and urine samples were taken from the majority of respondents had little formal education. The age of the respondents with a range of 20 to 65 years old. Result of the Hg analysis in the fish, water, rice, and vegetables are as follows (Hg in ppm): rice 0.133 – 0.035; vegetable 0.054 – 0.062; fish 0.037 – 0.90; water 0.001 – 0.0062. The hair had 0.028 – 0.84, urine 0.053 – 39.62. The observed Hg levels in urine detected exceeded normal levels, and several people who exceeded the maximum levels had health problems. It is necessary to analyze the health risk to the communities around the gold mining areas.

August 28 – September 1, 2017, Moscow, Russia

OH-08
THE POTENTIAL ENVIRONMENTAL & HEALTH IMPLICATIONS FROM BAXUIE TAILINGS DUST: A PILOT STUDY IN JAMAICA
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The production of alumina liberates waste known as bauxite tailing; which can be enriched with a suite of potentially harmful elements (PHE). This study aims to investigate the PHE contamination of soils and potential health implications of human inhalation to bauxite tailings. Environments situated around a 6km radius of a red mud lake were divided into Zones A (0-2km), B (2-4km) and C (4-6km). 65 subjects participated in a health survey, via interview questionnaire between all zones. 1 red mud sample and 35 soil samples were collected in these zones. Geochemical and Radiological analysis of samples were executed via XRF and Gamma Spectrometry, while questionnaire data was subjected to tabulation and graphic display of interpretation. It was observed that Fe was the highest major element concentration, within the Mud Lake and displayed enrichment within surrounding soils with increasing distance towards the red mud tailings. The Bauxite tailings consisted suite of Major (Fe > Ca > Al > Ti > Si > Mn > Mg > P), Minor (S > V > Cr > Zr > Sn > Cd) and Trace elements (U, Th, K). The most prevalent disease identified was Respiratory/ENT, followed by Metabolic and Oncological. Furthermore, the youngest cohort (<25 y.o) experiencing Respiratory/ENT and the eldest (70+) primarily experiencing oncological and neurological implications. The reposition of red mud lake dust has attributed to the PHE contaminant enrichment with increasing trends towards the lake. Also, there was notable health implications associated with closer inhalation near the lake.
OH-11
LOCALIZING CRYSTAL-SITES OF LONG-TERM RADICAL FORMATION IN WEATHERED CHrysotILE ASBESTOS
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Chrysotile-asbestos [Mg₃Si₂O₅(OH)₄] is a fibrous mineral used in construction industry for most of the last century. Upon inhalation fibers induce asbestosis, lung carcinomas and pleural mesotheliomas. Apart from low clearance rates, chrysotile induced injuries can be linked to its inherent fibrous morphology and surface chemistry. Fe is the most abundant redox-active metal in chrysotile and is substituted during petrogenesis into the structure of chrysotile: Ferrous and ferric Fe enter Mg-octahedral sites whereas exclusively ferric Fe enters Si-tetrahedral sites. Oxidants like H₂O₂ interact with Fe on the fiber surface and induce Fenton-like redox reactions, which generate reactive hydroxyl radicals with a high potency to damage biomolecules.

Under physiological and environmental conditions, chrysotile dissolution rates vary as a function of pH. Moreover, dissolution rates are accelerated by iron-specific biogenic ligands like desferrioxamine-B (DFOB). In dissolution studies at the physiological pH~7.4 we demonstrate by ICP-OES, EPR spin trapping and Mössbauer-Spectroscopy that the outermost Mg-layer of the fibers dissolves quickly within days, exposing a slowly dissolving Si-layer which hampers further dissolution. We found that the Fe-content of the quickly dissolving Mg-layer subsequently precipitates into Fenton-inactive Fe-hydroxides, whereas Fe²⁺ in the Si-layer remains Fenton-active for several weeks. The radical forming potential of the low abundant Fe²⁺ (7% of bulk-Fe) equaled 60% of the one of the whole octahedral Fe-content in the outer Mg-layer, and decreased to nearly background by complexation of Fe³⁺ by DFOB. Therefore, we conclude that Fe²⁺ is presumably the dominant site of long-term radical formation in chrysotile dissolving under physiological and environmental conditions.

SECTION: URBAN MEDICAL GEOLOGY: INTEGRATING GEOLOGIC AND ANTHROPOGENIC PROCESSES (UMG)

UMG-04
DISTRIBUTION AND HEALTH RISK ASSESSMENT OF HEXACHLOROCYCLOHEXANES (HCHs) IN URBAN SOILS WITH VARIOUS TYPES OF LAND USE IN BEIJING, CHINA

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The concentrations of hexachlorocyclohexanes (HCHs) were investigated for urban soil samples collected from different types of land use in Beijing of China, including business area, classical garden, culture and educational area, large public green space, residential area, and roadside area. The results showed that HCH concentrations ranged from 0.32 to 136.43 ng/g, with a geometric mean of 3.46 ng/g. The HCH concentrations in classical garden and large public green space were much higher than that in the other types of land use, which was due to the usage of HCHs to protect vegetation in classical garden and large public green space. Source identification showed that HCHs was mainly derived from historical HCHs (including technical HCHs and Lindane) as well as the long-range atmospheric transportation of HCHs. Generally, HCH concentrations showed a decreasing trend from the city center to the suburb, and it increased with the age of the urban area. HCHs concentrations were negatively correlated with pH and positively correlated with total organic carbon and black carbon contents in soils. Health risk assessment with CalTOX and Monte Carlo analysis showed that health risks mainly came from inhalation exposure and dermal uptake pathways, and the total risk values were lower than the acceptable health risk value (10⁻³). The sensitivity analysis indicated that the reaction half-life of HCHs in soil, fraction dermal uptake from soil, exposure duration, and organic carbon fraction in soil significantly contributed to the variance of the health risk.

UMG-05
PROFESSOR T. G. ILYINA CONTRIBUTION IN FORMATION OF MEDICAL GEOLOGY FUNDAMENTALS

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Doctor of Medical Science, Professor Tatyana G. Ilyina, was broadminded authority on ophthalmic surgery. She belonged to the third generation of family of doctors. Her broad-based knowledge and unconventional thinking let her be ahead in many aspects of her profession. She had acquired a wealth of knowledge and original ideas as well as ways of their implementation long before the studies on environmental factors impacts such as earthquakes on the organ of vision was started.
The result of her investigations based on observing and treatment of patients who suffered from glaucoma were especially successful in 1960s.

One of T.G. Ilyina’s prioritized research areas was the study of patients who have been affected with long-term stress-inducing factors related to the powerful Tashkent earthquake (1966). She was the first researcher who revealed the fact of intensive changes in intraocular pressure (IOP) over the whole six-month period of the mesozenozonal earthquake among patients who had glaucoma or were under observation due to glaucoma-prose. The changes were caused by central nervous system functioning under stress conditions and coincided in time with the strongest crust tremors. Intraocular pressure had been reduced in the majority of glaucoma patients. Due to overlapping of many factors (the multiplicative effect), the IOP had been steadily increased, so the process was decompensated. This unusual phenomena is rarely observed in everyday life and it can be explained as the result of a sudden general mental and physiological stress, which can lead to extreme disturbances of aqueous humour flow.

Since 1963 T.G. Ilyina became the first ophthalmologist who applied radioactivation analysis of essential and trace elements, including halogens, in ocular tissues affected by various pathological conditions. A practical application of radioactivation analysis in ophthalmology discovered unsurpassed opportunities of the studying of metabolic processes in healthy and pathologically changed human eye tissues. This method facilitates the research of particular changes that can be specific to certain medical entities. The analysis also serves as a basis for therapy targeted at the recovery of disrupted metabolic processes of essential and trace elements in the case of various pathological conditions in the eye. The total number of elements in humorous ocular tissue affected by glaucoma has been diminished. So the glaucomatous process seems to cause the disruption of the metabolic process in the tissues of an affected eye.

Also T.G. Ilyina observed influence of seasonal change on intraocular and eye humour dynamics of glaucoma patients and people with suspected glaucoma. During winter months (especially in the mornings) intraocular pressure was higher; production of aqueous humour and its outflow were increased. Meanwhile during summer months there was an opposite trend: intraocular pressure was lower, production of aqueous humour and its outflow were decreased. Clinical observation and experimental studies conducted by T.G. Ilyina have indicated that hyperthermia and its outflow were increased. Meanwhile during summer months there was an optical changes that can be specific to certain medical entities. The analysis also serves as a basis for therapy targeted at the recovery of disrupted metabolic processes of essential and trace elements in the case of various pathological conditions in the eye. The total number of elements in humorous ocular tissue affected by glaucoma has been diminished. So the glaucomatous process seems to cause the disruption of the metabolic process in the tissues of an affected eye.

The cities located in Western Siberia (Russia) have high levels of industrial development and high levels of air pollution. The anthropogenic sources are generally concentrated in the residential areas and contribute considerably to the total amount of particulate contaminants in the air, which have an adverse effect on human health. However, there are no sufficient published data regarding to the characterization of physical and chemical properties of solid airborne pollutants (SAP) in the cities of the Western Siberia. Therefore, it is very important monitoring, characterizing and quantifying SAP in the urban fabric of cities containing heavy industries. Snow cover is well known as an efficient scavenger of SAP and, thus, an effective indicator of urban atmosphere pollution.

The current study is aimed at assessment whether SAP could be traceable in snow deposits near particular anthropogenic activity in the cities of Western Siberia for the identification of anthropogenic emission sources and SAP potential effect on human health. We characterized SAP deposited in snow in cities with different anthropogenic activities, i.e. oil refinery (Omsk, Achinsk), chemical industry (Kemerovo), machine construction (Omsk, Yurga), cement manufacture (Topki), petrochemical industry (Tomsk), construction industries (Tomsk, Yurga), coal-mining (Mikhaylensk) and nuclear-fuel cycle complex (in 15 km from Tomsk). Additionally, fossil fuel thermal power plants are located in each city of Western Siberia. The characterization of SAP deposited in snow was performed by SEM-EDS, X-ray diffraction and laser diffraction particle size analyzer. Moreover, XRF analysis was applied to identification and characterization (morphology, size and element composition) of metal-bearing particles as they could cause adverse effect on human health. For example, rare-earth-bearing particles were identified around coal-fired thermal power plants, oil refinery plants and brickworks. Moreover, sulphates, sulphides, particles composed of toxic metal oxides, intermetallic compounds, rare-earth element-rich spheres and U-oxides were firstly identified around coal-fired thermal power plants. The samples collected near cement manufacture plant were composed of particles associated with Fe-Ca-oxides and Ca-rich spheres with impurities of Fe, Zn, Mg. The existence of U-oxides and graphite in the samples around nuclear-fuel plant could indicate its possible impact on the environment. The identified phases in SAP deposited in snow can be used as markers for source identification. Most of the identified individual particles were referred to inhalational and respiratory ones indicating their potential effect on human health if inhaled by inhabitants.
SECTION: ENVIRONMENTAL GEOCHEMISTRY (EG)

EG-01
SOIL CARBONATE MINERALS AND FOOD SAFETY: A FIELD INVESTIGATION FROM THE YANGTZE RIVER DELTA, CHINA
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It is well known that Ca²⁺ has a protective effect on metal uptake by the plants. Nevertheless, the mechanisms through which liming materials affect the bioavailability of heavy metals in soil remain poorly understood. Field investigations are rather limited. The objectives of this study were to obtain a quantitative estimate of Ni and Cd accumulation in winter wheat as affected by soil carbonate leaching losses in field conditions and to address the interrelationships between soil pH, carbonates, and plant uptake of heavy metals. The Yangtze River delta in China was chosen as the study area, which is an alluvial flood plain with concentrated industry and economy. Our results indicate that the carbonate concentration of soils in the Yangtze River delta region has been noticeably decreasing due to human-introduced acidification over the past 30 years, promoting plant uptake and accumulation of heavy metals from the acidified soils. When soil carbonates were severely leached to a concentration < 1% in soil, the grains of winter wheat grown in the acidified soils showed three times as much Ni and twice as much Cd concentration relative to the wheat grains harvested from carbonate-containing soils. The leaching of soil carbonate is the prelude of soil acidification and is an invisible threat to food safety. The findings suggest that soil carbonates play a critical role in heavy metal transfer from soil to plants, implying that monitoring soil carbonate may be necessary in addition to soil pH for the evaluating soil quality and food safety.

EG-02
MERCURY IN AMAZON RAINFOREST SOILS, BRAZIL
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Mercury is largely distributed in different ecosystems of the Amazon region, Brazil. Several human groups in the region are known to be exposed to mercury. Here we investigated the role played by the Amazon rainforest to capture mercury from post-industrial troposphere. Chemical composition of the northern portion of the Tapajós National Forest soil was determined in samples from eleven soil profiles. Major oxides and Hg concentrations in soil and parental rock were determined by X-ray fluorescence spectrometry and by Zeeman AAS, respectively. The bedrock contained 146 mg Hg/g whereas the soil presented an average content of 241 mg Hg/g. Furthermore, enrichment factors of Hg in relation to the parental bedrock were calculated assuming aluminum as immobile element. The lower soil layers presented mercury enrichment in the range of 29-98% in comparison to the bedrock. The upper soil layers present mercury enrichment of 4-24% in comparison to the samples from lower soil layers. Mercury in soil was highly correlated with Al, Fe and Ti but not significantly correlated with organic matter contents. All results pointed to mercury retention in Amazonian rainforest soils because of the combined action of rock weathering processes and continuous input of metal from the atmosphere. This contribution is estimated to be between 31 and 46% of the total Hg concentration in the upper soil layers. The results highlight the role of rainforests as a barrier for a number of substances associated with suspended atmospheric particles.

EG-03
SANITARY FUNCTIONS OF SOIL
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Sanitary soil functions make it safe for human habitation. They are usually associated with the ecological condition of soil biota and plants, as well as with the presence of pathogenic organisms or content of toxic substances. Some pathogens spend part of the life cycle in the soil, therefore, represent a direct danger to human health. Their impact is enhanced in the urban environment due to the alkalization of soils. However, the role of the soil in public health is not limited to environmental niches, it is much wider. Sanitary soil functions are connected with the surface of soil particles. Namely soil surface participates in the formation of immobilized enzymes, adhesion of microorganisms, metabolic reactions and processes of mobilization or immobilization of soil heavy metals and other pollutants. Moreover, soil mineral components themselves catalyze processes of human formation. Oxides and hydroxides of Mn and Fe catalyze the redox reaction of decomposition of inorganic and organic compounds. Manganese oxides accelerate the detoxification of infectious prion particles. On the other hand, clay minerals, as catalysts, increase by hundreds of times, the toxicity of prions. Thus, soil minerals may be catalysts as to reduce or increase the toxicity of pollutants. Adsorptive properties of the soil matrix are involved in the binding of contaminants and regulation of their mobility in the soil. Mobile forms of metals in the soil are a potential risk factor for human and animal health. They get into their bodies on environmental migration ways: soil – plants – animals – humans and the soil – water – people route. Currently, the proportion of human health outcomes attributed to environmental has increased significantly, in some cases up to 40%. Soil is a potential time bomb as a result of long-term accumulation of pollutants. Its sanitary function becomes just as important as its biosphere function and fertility in the development of civilization.

EG-04
DISTRIBUTION OF GERMANIUM IN SOILS IN THE SOUTHEAST AND PART OF THE NORTHEAST OF BRAZIL AND ITS IMPORTANCE FOR HUMAN HEALTH
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Organic germanium (Ge) has been highlighted in recent years, with properties to increase immunity and stimulate cicatricial processes, in the prevention and treatment of cancer, being that in Brazil, although it is not officially recognized by the organs responsible for public health, has been successfully used by orthomolecular medicine.

The Germanium helps normalize the function of T cells and B lymphocytes, exerting profound influence on the immune system. The size of the germarium sesequioxide allows its rapid absorption and transport through the membranes facilitating the diffusion of oxygen by cells and tissues. It can enhance the immune system, stimulate the production of interferon, and promote antitumor activity. Interferon’s most important function is to augment and stimulate the body’s production of natural killer (NK) cells, which directly combat cancer cells.

Various plants can be used to combat as a disease, such as a mushroom shelf, garlic, muss of lady, ginger, comfrey, and medicinal plants. Considering that the plants varies according to their availability in soil, it is presented below the results of Ge in samples of soil B horizon (25x25cm-0,177mm-sequica-riP-ICP-MAS) in parts of the northeast regions states AL-PB-PE-CE and midwest MS state and in the southeast states of SP-RJ-MG-ES.

The distribution of the Ge in the northeast, an area of 329,782km², with 486 soil samples, presented values (mg/kg) of 0.05 to 0.20 and median of 0.05, with the highest values of 0.10 to 0.20, representing 7% of the total samples. In the southeast and midwest, a distribution of Ge in an area of 1,283,745km², with 1904 soil samples, presented values (mg/kg) of 0.01 to 2.17 and median 0.05, being that the highest values 0.10 to 1.7, represent 6% of the total samples. Preferably the germanium occurs in soils originated from basic rocks (basalts, amphibolites). These results are similar to those found in Europe with values (mg/kg) of 0.02 to 0.26 and median of 0.035, USA 0.01 to 2.1, in Portugal 0.1 to 1.3 and well below China 1.2 to 3.2.

These results in soils may influence future research in regions where Ge values are high, to identify plants that absorb this element and that can be used by nutrological medicine.

EG-05
HEAVY METAL DISTRIBUTION OF STREAM SEDIMENTS IN GÜRKUYU SB MINERALIZATION (GEDIZ-KÜTAHYA, NW TURKEY)
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The Gürkuyu village is located approximately 23 km southwest of Gediz (Kütahya-Turkey) and 35 km east of Simav (Kütahya-Turkey). This village is located near the ophiolitic rocks of Dağardı mélange and Bifurkation. In the region, at the base, Precambrian Kalkan formation represented by migmatite and biotite-bearing gneiss is situated. The Budapest limestone unconformably overlies the Kalkan formation. These units are tectonically overlain by Upper Cretaceous Dağardı melange.

The ore mineral paragenesis from Gürkuyu Sh mineralization near Pınarbaşı village includes antimonite, pyrite, senarmontite, valessite, orpiment and realgar. In the ore petrographic analysis from Kocaağıl stream sediments, chromite, magnetite, pyrite, pyrrhotite, chalcopyrite and covellite are observed. In sediments collected from Kocaağıl stream located near Gürkuyu village, the average contents are 10.45 wt.% Fe₂O₃, 11.9 ppm Cu, 4.4 ppm Pb, 57.7 ppm Zn, 9.3 ppm As, 0.01 ppm Hg and 1748.5 ppm Cd.

The distribution of Ge in sediments has been successfully used by orthomolecular medicine.

Acknowledgments. This project has been supported by Scientific Research Project Coordination of Selçuk University (BAB Project No: 09101029 and 09401059) and TÜBİTAK (Project No: 110Y355).

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The Pınarbaşı village is located approximately 8 km northwest of Gediz (Kütahya-Turkey) and 50 km east of Simav (Kütahya-Turkey). This village is located in magmatic province. One of the characteristic feature of this granitoid and volcanic province is the presence of widespread associated hydrothermal activity contains significant accumulations of precious and base metals (Cu, Mo, Fe, Pb, Zn, Au, Ag, etc.).

The ore mineral paragenesis from Pb-Zn mineralization includes magnetite, chalcopyrite, galena, sphalerite, pyrite, talhore, bornite, hematite, covellite, chalcocite, digenite, cerussite, smithsonite, anglesite, malaichite and arsopite in Pb-Zn mineralization near the Pınarbaşı village. In the ore petrographical analysis from stream sediments, chromite, magnetite and pyrite are observed. In sediments collected from Seceği stream located near village, the average contents are 7.3 wt.% Fe₂O₃, 137.3 ppm Cu, 658.6 ppm Pb, 387 ppm Zn, 136.4 ppm As, 1.10 ppm Cd, 10 ppm Co, 0.2 ppm Hg and 79.4 ppm Ni. In sediments collected from Sarısu stream located near the village, the average contents are 5.5 wt.% Fe₂O₃, 77.6 ppm Cu, 132.4 ppm Pb, 63 ppm Zn, 3.9 ppm As, 0.2 Cd, 3.6 ppm Co, 0.01 ppm Hg and 11.7 ppm Ni.

Geochemical and mineralogical studies indicate that the Seceği stream sediment closer to Pınarbaşı Pb-Zn mineralization are rich in Pb, Zn, Cu, As, Cd, Hg and Ni contents. Both stream sediments have high values in Cu, Pb, Zn, As and Ni according to soil standards. As a result, the people living in the nearby environment are affected by mentioned heavy metals.

Acknowledgments. This project has been supported by Scientific Research Project Coordination of Selçuk University (BAP Project No: 09101029 and 09401059) and TÜBİTAK (Project No: 1101355).

EG-07

HEAVY METAL DISTRIBUTION IN THE SOUTHERN MERAM REGION (KONYA-TURKEY), WHICH IS A NEWLY URBANIZATION AREA

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Meram is one of the central districts of Konya, Turkey’s geographically largest city and rapidly urbanized. Metamorphic, magmatic and sedimentary rocks formed from Paleozoic to the present are crop out in the study area. These rocks were discussed in two main groups such as basic and cover units. In the investigation area, soils belonging to a zonal (brown, reddish chestnut color, reddish-brown, calcareous and non-calcareous brown forest soils), intrazonal (hydromorphic alluvial soils) and azonal (alluvial and colluvial soils), ordo possessed reddish chestnut color, reddish-brown, calcareous and non-calcareous brown forest soils), in- 

to the present are crop out in the study area. These rocks were discussed in two main groups and rapidly urbanized. Metamorphic, magmatic and sedimentary rocks formed from Paleozoic and

Jianghan Plain is a newly discovered arsenic affected area in the middle reaches of the Yangtze River, central China. Understanding the mechanism of arsenic (As) mobilization from sediments to groundwater is important for drinking water supply and water quality management in endemic arsenicosis areas. 187 sediment samples from two field boreholes (JH with the depth of 220m and YLY with the depth of 66m) and 681 groundwater samples were collected to characterize the geochemistry of multi-layers aquifer system in Jianghan Plain. The analysis results of sediment and groundwater samples indicated significantly different hydrogeochemistry between shallow aquifer (15-60m) and deep aquifer (>60m). The shallow sediments possessed an average As content of 9μg/g, which was mainly associated with reducible iron-oxides, and the As content in the groundwater was up to 2330 μg/L. The deep sediments possessed an average As content of 55μg/g, which was mainly associated with As-bearing pyrite and sulifides, and the highest As content in the groundwater was about 100 μg/L. The long-term monitoring of water chemistry and batch cultural experiments indicated that the shallow aquifer was recharged by surface water and atmospheric precipitation, and the organic carbon introduced by these exchanges could activate the As associated with reducible iron-oxides in the shallow sediments. These results could provide insights into the As mobilization mechanism in multi-layers aquifer system.

Acknowledgments. This study was supported by the National Natural Science Foundation of China (No.41521001 & No. 41572226).

ATE-02

SPATIAL DISTRIBUTION AND RISK ASSESSMENT OF AS AND METALS IN SEDIMENT OF KOCACAY RIVER IMPACTED BY HISTORICAL PB-ZN MINE WASTES

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The distributions of As and metals (Cu, Pb, Zn, Cd, Co) in surface sediments and water of Kocacay river, impacted by the historical Pb-Zn-Ag mine wastes, were determined to evaluate the level of contamination. Besides being the most important irrigation and agricultural water source Kocacay River feed the Lake Manyas know as bird heaven and hold great importance for public in the region. The ecological risk assessment of arsenic and metals in the sediments were evaluated by using the Sediment Quality Guidelines (SQG) of the United States of Environmental Protection Agency (USA EPA), contamination factor (CF), pollution load index (PLI), geoaccumulation index (Igeo) and enrichment factor (EF). Background values of the metals subjected to the study were determined on the sediment core taken from the region. The contamination level of sediments was correlated with the distance from the wastes and the highest contamination level As and metals were determined in the sediments near the mine wastes. The CF values of As, Cu, Zn, Pb was >6 in the impacted sediments, which demonstrates a very high contamination. Consistently, PLI values showed that the impacted sediments were heavily polluted in terms of As, Pb, Zn and Cu and moderately polluted by Cd and Co. The SQG value of As (>8) and Cu, Pb, Zn (25- 55) in sediments near the waste indicate heavy and moderate pollution, respectively. The mean EF values for As, Cu, Pb and Zn were >1.2 in the sediments of the Kocacay River, indicating dissolution and transportation of the metal from the mine wastes along the river. The SQG and current contamination level of As and metals in the sediments suggest that chronic exposures would be expected to cause harmful effect on sediment organisms and in turn food chain.

ATE-03

MERCURY ISOTOPES LINK THE SOURCE AND BIOMARKERS IN HUMAN MERCURY EXPOSURE

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Methylmercury (MeHg) is a highly toxic pollutant and human are exposed to MeHg mainly through fish and consumption. The mercury (Hg) isotopes are good tools to trace processes and sources of Hg in the environment. Prior studies in human populations reported a consistent ~2% increase in δ²⁰²⁰Hg values between fish and hair of fish consumers but without mass independent fractionation (MIF). In Hg mining areas, rice are the main source of human Hg exposure and metabolic process of Hg in human body.

Our previous study indicated that MeHg fractions in the rice samples were enriched in the δ²⁰²⁰Hg and Δ¹⁹⁹⁹Hg values from rice to blood and hair samples indicated the mixture of MeHg and Hg in human body. The Hg isotope studies can be used as good tools to trace the source of human Hg exposure and metabolic process of Hg in human body.
GEOPHYSICAL CLUSTERING OF URINARY STONE DISEASE IN CHINA: A GEO-ENVIRONMENTAL PERSPECTIVE

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The prevalence of urinary stone disease (USD) is increasing across the world and exhibits a distinctive characteristic of geographical distribution. We investigated the geographical clustering and major geo-environmental factors for USD prevalence in China. The average USD prevalence was 6.50% in China, which is lower in North China and significantly higher in South China. A map of USD prevalence in different provinces of China was presented, high risks of USD are found in southern China clustered in coastal provinces such as Fujian and Zhejiang and karst regions such as Sichuan, Chongqing, Guizhou, Guangxi, Guangdong, Hunan, and Hubei. The geographical distribution map of urinary stone composition shed light on the role of geo-environmental factors on USD genesis. We noticed that calcium phosphate or hydroxyapatite stone often occur around the phosphate mines, and the stone composition of karst regions is usually carbonate apatite. A possible explanation is that phosphorus released from phosphate mines by weathering or mining processes could be enriched in the soil and aquatic environment surrounding the mines, and that carbonate concentrations are commonly high in the environment of karst regions, both of which promote the formation of phosphorous/carbonate type stones via the food chain. Additionally, excessive sweating due to high air temperature and low urinary volume due to scant water intake are jointly responsible for the increasing USD prevalence in hot or warm climates and seasons. Water and soil environment influence the quality and composition of drinking water and food, thus affecting stone formation. The increase of Ca2+/Mg2+ ratio (in meq) in drinking water, the high content of calcium in local plants grown on karst soils, and the intake of high oxalate food might contribute to the high prevalence in South China. This study indicates that USD could be endemic, and geo-environmental factors should be critical in USD etiology.

Acknowledgments. This study was supported by the National Natural Science Foundation of China (No.41571301).

USE THE PHOSPHORUS AND OTHER FERTILIZERS, IS IT DANGEROUS?

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Many scientists believe that the planet Earth has entered into a new geological era. Conclusive evidence of significant human impact on the atmosphere, oceans, and wildlife have been published. In particular, the biogeochemical cycles of phosphorus and nitrogen were violated. As the result, the content of P and N in soil and water has increased and rate of freshwater body eutrophication has increased.

P content in the biosphere and its biogeochemical cycle have been declared as one of the planetary boundaries [1]. It means that an uncontrolled release of human-made P compounds into the environment may result in disastrous consequences for humankind. For example, there is evidence for direct positive effects of N and P on bacterial growth and, accordingly, total bacterial biomass is very strongly correlated with concentrations of total phosphorus in freshwater and marine ecosystems. Enhanced nutrient loading alone might also influence the abundance, composition, virulence and survival of pathogens that are already resident in aquatic ecosystems. For example, increased N and P availability enhances the replication rate of aquatic viruses.

Biological waste disposal activities such as manure applications to cropland can simultaneously enhance the loading of P, N and potentially hazardous coliform bacteria to surface waters [2].

To assess the impact of chemicals on the environment a model has been elaborated. The matrix algebra based approach is used as a tool for modelling and an estimation of chemicals in different environmental media (water, air, soil, biota, etc). For the evaluation of the phosphorus system we used a linear donor-controlled mass balance model.

The results of model application for the estimation of the P content in fresh waters of the Russian Federation regions are presented in Fig. 1. The concentrations were calculated using data on the mean water volumes in the regions.

The calculated results show that P loading is most characteristic of regions located in the European part of the country, which matches the ecological situation related to the eutrophication of water bodies in this territory, as well as some regions of the Siberian and Far Eastern Federal Districts.

This research was supported by the Russian Science Foundation, grant 15-17-30016.

ARSENIC IN GROUNDWATER OF DAGHESTAN REPUBLIC

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For the first time a relationship between the composition of the environment and living organisms’ state was shown by V.I. Vernadsky. Nowadays we have large knowledge about deficiency and excess of chemical elements and their relationship with human health. However, despite a wide range of information existing, the influences of some elements are still poorly understood. Bromine (Br) is one of these elements.

Br is a trace element and one of those that is more likely to pose a risk to human health, playing an important role in the appearance and development of various diseases. According to literature sources, high concentrations of the element were observed in various tissues and organs of people suffering from uremia, dilitated cardiomyopathy, sickle-cell anemia (hereditary disease), breast cancer, Alzheimer’s disease. However, no data about the evidence of bromine intake and these diseases was shown. Bromine can also have an effect on reproductive functions, reducing fertility and the viability of offspring. Besides, it has been identified as toxic.

In our research, bromine was studied in different environmental media in some regions of the world (France, Russia…). According to the results of INAA, the highest levels of bromine are observed in all the environmental media, including peoples’ organs and tissues, near the petrochemical enterprises and the enterprises of the nuclear fuel cycle. For example, 434 mg/kg, 162 mg/kg and 619 mg/kg of bromine was determined in the blood, hair and thyroid, respectively, of people living near the enterprise of nuclear fuel cycle. We assume that the most part of this bromine has an anthropogenic origin. Results obtained are hundreds of times higher than data described in literature sources. Therefore, this issue is of a great attention. The need to study this element and its possible effects on people health is obvious and beyond doubt.
Introduction. The given arsenic-related research has established that the population of about 500 thousand people are at risk. In the northern districts of Daghestan republic the groundwater is used by population as drinking water. Water samples analysis showed that groundwater contains arsenic above the WHO-recommended value of 10μg/L. The concentrations of As in water samples ranged from 10μg/L to 50μg/L. The natural As is associated here with the peculiarities of the chemical composition of the water-bearing plates and people have no alternative sources of drinking water. Biological samples (hair) analysis clearly showed that the body burden of As was close to the limit level of 1,000 μg/kg that is considered to be a toxic level of As in hair.

Long-term exposure to As from drinking water can cause cancer, that’s why it has been classified as a carcinogenic to humans by International Agency Research of Cancer (Group 1) and by the United States Environmental Protection Group (AARC, 1987; US EPA, 2001). The cancer health risks results were found to be higher than of permissible value of 1x10^-6. For the exposed population annual population cancer health risks ranged from 1 to 95 additional cases of possible occurrence of cancer. The results of this study revealed areas with high levels of As in drinking water and determine the exposed population to the implementation of risk mitigation measures.

Materials and Methods. Water samples were collected from the arsenic-contaminated ground water in the north districts of Daghestan Republic. Biological (hair) samples were collected from the villagers of high arsenic-contaminated village, because the concentration of As in hair samples serves as an indicator of the body burden of arsenic.

Water and hair samples were analyzed for As by flow-injection hydride generation-atomic absorption spectrophotometry (FI-HG-AAS). During the analyze total As was determined in samples.

Cancer risk for population was evaluated using risk assessment method. Results. The northern districts of the Daghestan are contaminated by high levels of natural As. 53.9% of population use drinking water with the level of As 10-40 μg/L. Groundwater with the high concentration of As (400-500 μg/L) used by 3% of the northern districts population. The level of As in the water is detected 20 times or more in 12 villages with the total population of about 16 thousand of people.

It has been shown that the lifetime individual cancer risks were at the minimum concentration (10 μg/L) 1, 4.3E-7; at maximum concentration (500 μg/L) – 2.1E-2, respectively, with a mean of 140 μg/L – 6,0E-3. The lifetime individual cancer health risks results were found to be high and not permissible for population. The annual cancer health risks for population were from 1 to 95 additional cases of possible occurrence of cancer.

The result of this research reveals the high level of danger of using groundwater by population as drinking water.

ATE-10
HIGH AS AND F CONCENTRATIONS IN DRINKING WATERS OF SOUTHERN PAMPEAN PLAIN, ARGENTINA—HEALTH IMPACT STUDY
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The Chacochefl ural basin is situated in the southern Pampean Plain, Argentina. This region, composed mostly of Neogene and Quaternary vulcanoclastic loess, shows one of the highest groundwater As concentrations threatening serious problems to human health. Fluoride is also co-occurring exceeding the WHO suggested value of 1.4 mg/L. The volcanoclastics are postulated to be the main source of As and F in groundwaters that result from the dissolution of volcanic ashes as well as other minerals (e.g. fluorapatites). Amorphous Fe oxy-hydroxides also play an important role in these processes. Results show that almost all samples studied exceed WHO limits for As and F reaching maximum values of 144 μg/L and 4.7 mg/L respectively. Furthermore, higher As and F concentrations are in shallow groundwaters and decrease in concentration with depth. An increase in both the elements, its sediments and drinking waters, is observed downward into the southern basin toward the Atlantic coastline. Only two towns within this study area are provided with water treatment facilities, while the rest of the population, that include rural schools (that have their own drinking water wells) are lacking access to safe waters and are poorly informed about these issues. In the southern basin multiple cases of fluorosis are diagnosed in children. No toxicological background is present in the communities to link cancer cases with As impact. This fact enhances the need of more toxicological studies in the area and public policies to systematically exist the presence of these issues and thereby promote remediation strategies.

ATE-11
INTERCONNECTIONS OF CHEMICAL COMPOSITION OF ANTHROPOGENIC CARBONATES AND HUMAN HEALTH DATA
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3INCITAP (CONICET-Universidad Nacional de La Pampa), Santa Rosa, La Pampa, Argentina

Anthropogenic carbonates, also known as "limescale", forms in household conditions in the heat exchanging equipment (mostly kettles) when boiling water. In our opinion, such deposits could stand as an indicator of long-term drinking water quality (months or even years) as long as most people drink Ca-Mg-HCO₃ water. Therefore, the goal of our current investigation is to attempt to find interconnections between chemical composition of drinking water limescale and general and specific incidence. As research area, we chose Pavlodar Oblast (Kazakhstan). There we collected 207 samples of anthropogenic carbonates from local citizens and revealed content of 28 chemical elements (Ag, As, Au, Ba, Br, Ca, Co, Cr, Cs, Eu, Fe, Hf, La, Na, Nb, Rh, Sc, Sm, Sr, Ta, Tb, Th, U, Yb, Zn). Further, we get official medical data on public health and morbidity rate. Both chemical composition of the limescale and medical data were compared. Comparative analysis reveals that all the studied districts in Pavlodar Oblast can be divided into three groups according to correlation of limescale’s chemical composition and morbidity rate. The highest variables of morbidity rate are stated in areas with elevated concentrations of REE, Th, U. In opposite, districts with low content of chemical elements in the limescale are characterized with low morbidity rate. Furthermore, the significant negative correlation was established between Ca and blood and alimentary systems diseases. Content of REE, Th are in positive correlation with diseases of apparatus, alimentary systems, neoplasms and congenital malformations, deformations and chromosomal abnormalities.

Therefore, the element composition of the anthropogenic carbonates could stand as an possible indicator of morbidity rate of diseases that are associated with drinking water.

ATE-09
THE MAIN DIRECTIONS OF THE ENVIRONMENTAL JUSTIFICATION FOR THE DEVELOPMENT OF ELANS AND JOLKINSK COPPER-NICKEL DEPOSITS
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Spatial combined Elans and Jolkins deposits of copper-nickel ore formed within long-lived tectonic node, it manifests itself in crystalline bedrock, sedimentary cover and in a modern landscape. Modern structural line maximum tension of the crust control figure the network of river systems. Geological characteristics of the region and its Geodynamics are the main cause of the current complex geological environment here. At depths below 250 meters in aquifers appear low salt and salty water, brines are below. They have a radon in soil that 3-4 times near the well reaches more than 20 000 Bk/m3 (ceiling sensitivity RRA-01 m~01) only on Alpha activity of maximum permissible concentrations from 2 to 50 exceeded times.

The results of the monitoring of the ecological-geological territory: spout deep chloride-bromine highly mineralized waters with General mineralization of Ag, As, Au, Ba, Br, Ca, Co, Cr, Cs, Eu, Fe, Hf, La, Na, Nb, Rh, Sc, Sm, Sr, Ta, Tb, Th, U, Yb, Zn. Further, we get official medical data on public health and morbidity rate. Both chemical composition of the limescale and medical data were compared. Comparative analysis reveals that all the studied districts in Pavlodar Oblast can be divided into three groups according to correlation of limescale’s chemical composition and morbidity rate. The highest variables of morbidity rate are stated in areas with elevated concentrations of REE, Th, U. In opposite, districts with low content of chemical elements in the limescale are characterized with low morbidity rate.

Furthermore, the significant negative correlation was established between Ca and blood and alimentary systems diseases. Content of REE, Th are in positive correlation with diseases of apparatus, alimentary systems, neoplasms and congenital malformations, deformations and chromosomal abnormalities.

Therefore, the element composition of the anthropogenic carbonates could stand as an possible indicator of morbidity rate of diseases that are associated with drinking water.

ATE-12
DRINKING WATER (GROUND AND SURFACE), IRON OVERLOAD AND LIVER PATHOLOGY
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2Pathology Dept, Faculty of Medicine, Mansoura University, Egypt

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Background. Several diseases have been caused by contamination of surface and groundwater.

Aim. The aim of the present work is to investigate the impact of iron overload in drinking water on liver pathology.

Materials and Methods. Samples of drinking water, blood and true cut liver biopsies were taken from selected inhabitants, who attended in some Dakahlia governorate hospitals. Those inhabitants (16 patients) from Mit-ghana and Aga districts were suffering from iron overload (had hepatitis C) and 4 patients had chronic cholecystitis from Mansoura district as control cases. Measurement of iron level in water samples was carried out by the use of
an atomic absorption spectrophotometer, analyzed for serum iron level with a micro lab 200 spectrophotometer.

**Results.** The mean value of iron in surface water is lower than the permissible limit of Egyptian ministry of health (EMH) and World health organization (WHO). However, the mean value of iron in groundwater samples is higher than that permissible limit and than those of surface drinking water. Comparison between iron level in drinking water and human blood samples shows positive relationship. The control group depended on drinking surface water and had normal liver function tests, whereas the patient group that depended on drinking groundwater had abnormal values in liver function tests. These data suggest that the polluted iron drinking water is the reason for the liver disorder of the patients. Siderosis was apparent among those patients depending polluted iron water in comparison to control cases. The siderosis appears to be responsible for resistance to treatment of HCV and progression of fibrosis.

**Conclusion.** The accumulation of iron in liver leads to fibrosis. Iron depletion therapy could interfere with fibrosis development and possibly reduce the risk of hepatocellular carcinoma (HCC).

**SECTION:**

**OCCUPATIONAL HEALTH ISSUES AND MEDICAL PROBLEMS OF MINING AREAS (MA)**

**MA-01**

**SPATIAL DISTRIBUTION AND RISK ASSESSMENT OF AS AND METALS IN SEDIMENT OF KOCACAY RIVER IMPACTED BY HISTORICAL PB-ZN MINE WASTES**

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*ncelik@itu.edu.tr

The distributions of As and metals (Cu, Pb, Zn, Cd, Co) in surface sediments and water of Kocacay River, impacted by the historical Pb-Zn-Ag mine wastes, were determined to evaluate the level of contamination. Besides being the most important irrigation and agricultural water source Kocacay River feed the Lake Manyas know as bird heaven and hold great importance for public in the region. The ecological risk assessment of arsenic and metals in the sediments were evaluated by using the Sediment Quality Guidelines (SQG) of the United States of Environmental Protection Agency (USA EPA), contamination factor (CF), pollution load index (PLI), geoaccumulation index (Igeo) and enrichment factor (EF). Background values of the metals subjected to the study were determined on the sediment core taken from the region. The contamination level of sediments was correlated with the distance from the wastes and the highest contamination level As and metals were determined in the sediments near the mine wastes. The CF values of As, Cu, Zn, Pb were >6 in the impacted sediments, which demonstrates a very high contamination. Consistently, PLI values showed that the impacted sediments were heavily polluted in terms of As, Pb, Zn and Cu and moderately polluted by Co and Cd. The SQG value of As (>8) and Cu, Pb, Zn (25-55) in sediments near the waste indicate heavy and moderate pollution, respectively. The mean EF values for As, Cu, Pb and Zn were >1.2 in the sediments of the Kocacay River, indicating dissolution and transportation of the metal from the mine wastes along the river. The SQG values and current contamination level of As and metals in the sediments suggest that chronic exposures would be expected to cause harmful effect on sediment organisms and in turn food chain.

<table>
<thead>
<tr>
<th>Enrichment Factor (EF) – Contribution of anthropogenic sources to surface soils</th>
<th>EF As</th>
<th>EF Cd</th>
<th>EF Cr</th>
<th>EF Cu</th>
<th>EF Pb</th>
<th>EF Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borralha soils (n=77)</td>
<td>6</td>
<td>16,6</td>
<td>1,1</td>
<td>166,1</td>
<td>4,7</td>
<td>3,1</td>
</tr>
<tr>
<td>Panasqueira Soils (n=126)</td>
<td>14,5</td>
<td>4</td>
<td>1,4</td>
<td>3,4</td>
<td>1,6</td>
<td>1,6</td>
</tr>
<tr>
<td>Borralha outdoor Dusts (n=7)</td>
<td>0,3</td>
<td>0,3</td>
<td>0,4</td>
<td>6,7</td>
<td>1,1</td>
<td>1,3</td>
</tr>
<tr>
<td>Panasqueira outdoor Dusts (n=34)</td>
<td>92,7</td>
<td>3,4</td>
<td>0,5</td>
<td>18,8</td>
<td>1,1</td>
<td>3,6</td>
</tr>
</tbody>
</table>

**EF=2 deficiency to minimal; 2<EF<5 moderate; 5<EF<20 significant; 20<EF<40 very high; EF>40 extremely enrichment**

<table>
<thead>
<tr>
<th>Pollution Index (PI) – ratio metal concentration in soil and reference value</th>
<th>PI As</th>
<th>PI Cd</th>
<th>PI Cr</th>
<th>PI Cu</th>
<th>PI Pb</th>
<th>PI Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borralha soils (n=77)</td>
<td>2,2</td>
<td>1,8</td>
<td>0,4</td>
<td>45,9</td>
<td>1,9</td>
<td>1,3</td>
</tr>
<tr>
<td>Panasqueira Soils (n=126)</td>
<td>6,6</td>
<td>0,6</td>
<td>0,6</td>
<td>1,4</td>
<td>0,9</td>
<td>0,9</td>
</tr>
<tr>
<td>Borralha outdoor Dusts (n=7)</td>
<td>0,3</td>
<td>0,3</td>
<td>0,2</td>
<td>1,8</td>
<td>0,7</td>
<td>0,8</td>
</tr>
<tr>
<td>Panasqueira outdoor Dusts (n=34)</td>
<td>26,1</td>
<td>6,2</td>
<td>0,4</td>
<td>9,3</td>
<td>1,0</td>
<td>4,3</td>
</tr>
</tbody>
</table>

**PI<1 no contamination; 1<PI<3 slight contamination; 3<PI<5 moderate; PI>5 severe contamination**

<table>
<thead>
<tr>
<th>Ecological risk index (RI) – HM concentration, ecological effect, environmental effect and toxicology</th>
<th>RI As</th>
<th>RI Cd</th>
<th>RI Cr</th>
<th>RI Cu</th>
<th>RI Pb</th>
<th>RI Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borralha soils (n=77)</td>
<td>3457</td>
<td>25527</td>
<td>137,1</td>
<td>36363,3</td>
<td>1162,5</td>
<td>154,6</td>
</tr>
<tr>
<td>Panasqueira Soils (n=126)</td>
<td>16508,2</td>
<td>12720,0</td>
<td>329,5</td>
<td>1920,7</td>
<td>899,3</td>
<td>178,0</td>
</tr>
</tbody>
</table>

**RI<150 low; 150<RI<300 moderate; 300<RI<600 considered ecological risk; RI>600 very high ecological risk**

<table>
<thead>
<tr>
<th>Biocummulation factor (BCF) – mobility of HM from rhizosphere soils into different parts of the plant (orange values 1&lt;BCF&lt;10)</th>
<th>As</th>
<th>Cd</th>
<th>Cr</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borralha cabbage stem (n=7)</td>
<td>0,092</td>
<td>0,336</td>
<td>0,287</td>
<td>0,146</td>
<td>0,007</td>
<td>0,524</td>
</tr>
<tr>
<td>Borralha cabbage root (n=7)</td>
<td>0,385</td>
<td>0,4190</td>
<td>0,825</td>
<td>1,1034</td>
<td>6,5454</td>
<td>2,0380</td>
</tr>
<tr>
<td>Borralha cabbage leaf (n=7)</td>
<td>0,0000</td>
<td>0,3007</td>
<td>0,1993</td>
<td>0,1583</td>
<td>0,0052</td>
<td>0,4303</td>
</tr>
<tr>
<td>Panasqueira cabbage stem (n=28)</td>
<td>0,038</td>
<td>1,1152</td>
<td>0,385</td>
<td>0,709</td>
<td>0,092</td>
<td>0,510</td>
</tr>
<tr>
<td>Panasqueira cabbage root (n=28)</td>
<td>0,037</td>
<td>1,152</td>
<td>0,385</td>
<td>0,709</td>
<td>0,092</td>
<td>0,510</td>
</tr>
<tr>
<td>Panasqueira cabbage leaf (n=28)</td>
<td>0,009</td>
<td>2,804</td>
<td>0,050</td>
<td>0,148</td>
<td>0,012</td>
<td>0,356</td>
</tr>
</tbody>
</table>

**BCF<1 no metal; 1<BCF<10 metal accumulation; BCF > 10 hyperaccumulation**

<table>
<thead>
<tr>
<th>Health Risk Index – exposure to HM</th>
<th>As</th>
<th>Cd</th>
<th>Cr</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borralha Adults (body weight 60 kg)</td>
<td>1,228575</td>
<td>0,5101443</td>
<td>0,508957</td>
<td>0,1764496</td>
<td>0,0340025</td>
<td>0,1406166</td>
</tr>
<tr>
<td>Borralha Childrens (body weight 32,7 kg)</td>
<td>1,5074453</td>
<td>1,3247991</td>
<td>0,5895845</td>
<td>0,2717162</td>
<td>0,0425279</td>
<td>0,1809073</td>
</tr>
<tr>
<td>Panasqueira Adults (body weight 60 kg)</td>
<td>0,9529976</td>
<td>0,0879295</td>
<td>0,523103</td>
<td>0,0913177</td>
<td>0,0570757</td>
<td>0,0887721</td>
</tr>
<tr>
<td>Panasqueira Childrens (body weight 32,7 kg)</td>
<td>1,1429587</td>
<td>0,108572</td>
<td>0,312298</td>
<td>0,1162749</td>
<td>0,0683563</td>
<td>0,1059341</td>
</tr>
</tbody>
</table>

**PM-12**

**UPTAKE OF METAL(L)OIDS BY CABBAGE (BRASSICA OLERACEA L.) AND CHEMICAL RISK OF CONSUMPTION IN CONTAMINATED SOILS FROM TUNGSTEN MINES IN PORTUGAL**

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Metal mining and mineral processing might be the source of trace metals in soils, being the reservoir for heavy metals (HM) and metalloids, which pose serious environmental problems due to their potential toxicity and persistence in the environment. Panasqueira and Borralha mines, the biggest tungsten mines in Portugal, are characterized by the presence of sulphide mineralization including arsenopyrite, pyrite, pyrrhotite, sphalerite, chalcopyrite and stannite at Panasqueira; and molybdenite and bismuthinite and absence of arsenopyrite in Borralha. As a result of increasing anthropogenic activities, HM pollution in soils, plants and the atmosphere have resulted in a growing environmental problem affecting food quality and potentially the health of the local population. An important concern for assessing human health risk is the uptake of soil contaminants by plants and their consumption by humans. A study was undertaken using soils, outdoor dusts, cabbage and rhizosphere soils. The strong relationship between metal concentrations in soils and vegetables and the results obtained through the determination of enrichment factor, pollution index, ecological risk index and bioconcentration factor revealed that the consumption of vegetables is not free of risks in these areas. The health risk assessment tells us that vegetables grown in the vicinity of these two mining areas potentially pose a significant health risk to local populations. Based on the values determined, soils and outdoor dusts from Panasqueira and Borralha present different behaviors, with respect to some of the studied metal(l)oids, and in an attempt to justify those differences, mineralogical studies of soils and dusts are currently being carried out.
MA-03

IMPACT OF HEAVY METALS CONTAMINATION BY ARTISANAL GOLD MINING AT JATIROTO VILLAGE, WONOGIRI DISTRICT, CENTRAL JAVA, INDONESIA ON STREAM SEDIMENT

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Bacteria in the greater environment are seen to be responsible for a variety of concretions i.e. Stromatolites, ooliths and calcium carbonate concretions. The structure and shape of their concretionary product is closely linked to the nutrients available in their immediate environment. Their environments can be ascertained by studying the molecular and isotopic structure of their fabricated products. It is believed that doing so will yield similar information as to why gallstones form and the reason for their various morphologies/shapes. Long standing debates about the likelihood of biogenic or abiogenic processes developing various concretions in the natural environment are a regular point of contention when dealing with biomineralisation. The most notable of these debates centres on ooliths, calcium carbonate nodules and, more recently, calcifications and lipid concretions in the human body. Although the current research has led to a more biogenic view with the former two topics, those involving the human body are only at the beginning of such debates. The objective of this study is to identify possible analogues between the human microbiome and the environments that lead to biomineralisation/concretionary structures within these systems. We will aim to investigate whether particular bacterial species are implicated in the crystallisation/accretion of gallstones in the gallbladder. We will compare these results with Ooliths; calcium concretions found abundantly in various environmental contexts where bacterial precipitation of the calcium oxalate matrix is well understood. We hope this novel approach will reveal clues to the mechanisms behind lithogenesis of gallstones in the human body.

MA-04

POPULATION MORBIDITY DUE TO LIQUIDATION OF COAL DEPOSITS IN UKRAINE

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Donetsk and Lviv-Voyn coal basin of Ukraine are distinguished by critical state of the environment, as they are the oldest regions of the underground mining method, where environmental problems were accumulating over decades as a result of defective technologies usage, mining at large areas (thousands of square kilometers) and depths (up to 1.5 km) accumulation of large amounts of solid and liquid wastes on the surface. Coal fields decommissioning and coal mines closing within the Donetsk coal basin is accomplished by such environmental problems: violation of hydrogeological regime of coal mining regions; pollution of groundwater and surface waters by mineralized mining waters; exclusion of areas to accommodate waste dumps and other waste; pollution of natural environment with coal mining waste; deformation, subsidence and Earth’s surface underflooding above mining works; pollution of environmental objects with greenhouse and radioactive gases; air pollution with dust and gaseous substances from the surface of rock dumps, including when they are burning; underflooding, salinity and land degradation, including agriculture; deterioration of living conditions of the population in coalmining regions; increased morbidity.

One of the progressive consequences of environmental conditions deterioration in the Donetsk coal basin is an increase in population morbidity, reduced life expectancy and population quantity (up to 1.3–1.5% per year). In particular the mortality rate exceeds the birth rate by 2.8 times in the Donetsk region.

Environmental problems are acute also for Lviv-Voyn basin, where they acquired a massive character: area subsidence, including residential areas, due to low depth (410–550 m) working out of multiple layers (capacity of each one – 0.8–1.4 m), lack of mortgage works, complete collapse of roof workings; flooding, underflooding and waterlogging of soils (today these processes cover an area of approximately 90 km²);

Soil subsidence under waste accumulators, heaps, mining water pipelines, causing regular accidents; underwater pumping of water in the region (Donpetro, Mezhduryady, etc.), which can lead to contamination of the Cernovoi aquifer – productive horizon of drinking fresh groundwater of the region; presence of empty rock dumps in the basin and coal mine drainage.

The content of fluoride in all water intakes within Chervonohrad mining region changes from the norm to 2–2.5, sometimes – up to 3.8 mg/dm³, where there is a low level of calcium (16–34 mg/dm³) and very high content of sodium, potassium (Na + K – 212–130 mg/dm³) and strontium (5.95 mg/dm³). Thus the lowest content of calcium in the water of the Cretaceous aquifer is within Sosnyskiy waste water intake.

Very low calcium content and significant excess of sodium, potassium, strontium and fluoride in drinking water create favorable conditions for the development of hypoplasia and fluorosis. This situation is generally typical for other intakes in Chervonohrad mining region.

All the mentioned above indicates that the elimination of economic activity at mining enterprises does not guarantee the termination of impact on the environment and public health and in some cases even complicates the situation. The reason for this is the absence of an integrated approach to address the economic, technological, environmental and social problems of mining enterprises liquidation.

That’s why mine closure should be conducted in a way to avoid negative effect on the environment and health of population living in these areas.

MA-05

MOLECULAR, ISOPTIC AND GENETIC COMPOSITION OF HUMAN GALLSTONES: A GEOMEDICAL STUDY

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2Fiona Stanley Hospital, Perth, Postcode, Australia
3sureyya.kose@postgrad.curtin.edu.au

Bacteria in the greater environment are seen to be responsible for a variety of concretions i.e. Stromatolites, ooliths and calcium carbonate concretions. The structure and shape of their concretionary product is closely linked to the nutrients available in their immediate environment. Their environments can be ascertained by studying the molecular and isotopic structure of their fabricated products. It is believed that doing so will yield similar information as to why gallstones form and the reason for their various morphologies/shapes. Long standing debates about the likelihood of biogenic or abiogenic processes developing various concretions in the natural environment are a regular point of contention when dealing with biomineralisation. The most notable of these debates centres on ooliths, calcium carbonate nodules and, more recently, calcifications and lipid concretions in the human body. Although the current research has led to a more biogenic view with the former two topics, those involving the human body are only at the beginning of such debates. The objective of this study is to identify possible analogues between the human microbiome and the environments that lead to biomineralisation/concretionary structures within these systems. We will aim to investigate whether particular bacterial species are implicated in the crystallisation/accretion of gallstones in the gallbladder. We will compare these results with Ooliths; calcium concretions found abundantly in various environmental contexts where bacterial precipitation of the calcium oxalate matrix is well understood. We hope this novel approach will reveal clues to the mechanisms behind lithogenesis of gallstones in the human body.
SECTION: RADIOACTIVITY, RADIO GEOECOLOGY AND HUMAN HEALTH (RRG)

RRG-01
HIGH NATURAL RADIOACTIVITY IN THE SOILS AS A REASON OF RADIOECOLOGICAL PROBLEMS
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Introduction. There are several provinces on the globe that have high natural radioactivity in soil. The elevated contents of natural radionuclides in the soils lead to high concentrations of radon, which, in turn, causes radioecological problems. Scientists have proven negative effects on human health associated with high average doses of radiation. Epidemiological data of cancer morbidity and mortality are available which, however, require considerate interpretation.

Purpose. We give an overview on radiogeochemical and mineralogical features of soils and comparisons of geological and radiochemical maps in Chinese Guangdong province (CGP) and in French Auvergne region (FAR).

Material and methods. Our research includes detailed surveys of chemical composition of 37 soil samples from CGP and FAR by result of instrumental neutron activation analysis (INAA), results of gamma-spectrometric soil analysis, the vertical distribution of radionuclides in the soil samples, the results of radiochemical analysis by using electron microscope Hitachi S-3400N.

Results and discussion. The preliminary gamma-spectrometric soil analysis shows that they are characterized by thorium radioactive nature (Th-190 Bq/kg; U in terms of Ra) -120 Bq/kg; 40-K -90 Bq/kg).

Table 1. Geochemical and mineralogical features of human body ash residue

<table>
<thead>
<tr>
<th>City</th>
<th>Geochemical features (high accumulation)</th>
<th>Mineralogical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novosibirsk</td>
<td>Au, Cu, Ba, Sr, Co, La, Fe, Sn, Sc, Na, Ag</td>
<td>Monazite, mineral phases of Au, Pb, etc.</td>
</tr>
<tr>
<td>Yekaterinburg</td>
<td>Bi, Cd, Pb, Sr, Ba, N, Ha, HF, K, V, Na, Ag</td>
<td>Mineral phases of Co, Pb, etc.</td>
</tr>
<tr>
<td>St. Petersburg</td>
<td>Tb, Lu, Ti, Ag, Cu, Zn, Mn, Sn, Ba, Co, Na, K</td>
<td>Mineral phases of Nb, Sr, etc.</td>
</tr>
<tr>
<td>Norilsk</td>
<td>Ca, Zr, Sm, Al, Ho, Y, Gd, Dy, Pr, Nd, Ce, Tb</td>
<td>Monazite, zircon, mineral phases of Cu, Ni, Cr, Sn, Na, Pb, Sr, etc.</td>
</tr>
</tbody>
</table>

Fig. 1. Soil profile and graphs of U, Th, Th/U distribution (mg/kg) by INAA

RRG-02
MINERALOGICAL AND GEOCHEMICAL COMPOSITION OF HUMAN BODY ASH RESIDUE AS REFLECTION OF ENVIRONMENTAL FACTORS
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It is obviously, that human, as a part of ecosystem, is closely connected with the environment. Besides, numerous studies of last decades prove the fact that composition of human organism reflects the impact of natural and technogenic environmental factors as well as the composition of the environment. Since the population of urban areas is increasing every year, it is extremely important to estimate the impact of urban ecosystem on the human and health. Due to such need it was set the objective to assess the influence of some Russian cities at the element and mineral composition of the human body. To get new knowledge in this field the Department of Geology and Geochemistry of Tomsk Polytechnic University is studying such material as human body ash residue (HBAR), which has been sampled in different Russian cities. Ash residue is the crematory material remaining after the human body has been burnt at the temperature of 900-1100 °C. The data are obtained by such accurate methods as INAA, ICP-MS, X-ray analysis and electron microscopy. A long-term study of this material shows that the human body ash residue of every studied city has specific geochemical features reflecting geochronological characteristics of the habitat in certain cases. Geochemical and mineralogical features of HBAR, which were sampled in different cities, are presented below.

RRG-03
ANOMALOUS CONCENTRATIONS OF RADIONUCLIDES IN GROUNDWATER OF EDE AREA, SOUTHWESTERN NIGERIA: A DIRECT IMPACT OF METAMICITIZATION?
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An assessment of groundwater in areas underlain by pegmatite around Ede, southwestern Nigeria was carried out to determine the concentration of Potassium (40-K), Uranium (238-U) and Thorium (232-Th) radionuclides. In the earlier work, it was established that zircons in these pegmatites have suffered high degree of metamictization that has enhanced continuous released of radionuclides into the environment since the time of emplacement of the pegmatite host rock to the present. The purpose of this work is to determine whether or not there is corresponding increase in the concentration of radionuclides in groundwater in the study area.

Fifteen (15) groundwater samples were collected from wells and boreholes for analysis. Ten (10) samples were collected from Ede, two each from nearby communities of Iddo and Ekuro, and one from Iwoye where the bedrocks are not pegmatites. The analysis was carried out using the Sodium Iodide scintillator detector (NaI [TI]) at the Centre for Energy Research and Development (CERD), Obafemi Awolowo University, Ile-Ife, Nigeria.

The results show varying concentrations of the radionuclides in the water samples. Activity concentration of Potassium (40-K) indicated an average of 17.14 Bq/L for samples from Ede, 9.265 Bq/L for Iddo, 6.68 Bq/L for Ekuro and 21.25 Bq/L for Iwoye. The Uranium series had an average of 13.48 Bq/L for Ede, 11.68 Bq/L for Iddo and 12.04 Bq/L for Ekuro. Thorium series had an average of 11.18 Bq/L for Ede while an average of 7.97 Bq/L for Iddo and 12.25 Bq/L for Ekuro.

The radionuclide concentrations in groundwater in these areas are largely above World Health Organization permissible limits. The high radionuclide concentrations recorded for Ede is probably due to release from pegmatites while those for other communities could be as a result of lateral mobility of ground water and these ions in the region.

Undoubtedly, the high radionuclides in the groundwater in Ede area are possibly connected with metamictization that has affected zircons and related minor minerals in pegmatite of that area. There is thus the need to carry out systematic studies of the radionuclide concentrations on regional scale in the area and these could lead to investigating on both short and long terms medical effects on animals and humans in these areas. There is also need to purify the ground water in this area for domestic and industrial uses. This study also shows the need to carry out properly and detailed chemical and radioisotope investigations before harnessing underground water in areas underlain with pegmatites or related rocks.

RRG-04
AREAS WITH A HIGH CONTENT OF RADIOACTIVE ELEMENTS AND SOME MEDICO-BIOLOGICAL PROBLEMS IN THESE AREAS
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There are areas on the globe with high radioactive formations (rocks, ores, soil, water), caused accumulation of U, Th, decay products and isotope K-40. Squares of these regions vary from few km2 (U and Th mining areas, water sources) to many thousands of km2 (districts of alkaline and...
acquired magmatic rocks: Transbaikali in Russia, the Massif Central in France etc., the soil formed on radioactive rocks: soil – water/air – living organisms, observing the laws of migration, scattering and accumulation. In cases of fairly high concentrations of radioactive elements the negative impacts on biota and humans can be detected.

Such examples were known before the discovery of radioactivity when effects of human exposure were observed but could not be explained. For example, the disease of “Mountain spirits” in the ore zones in the Czech Republic and Germany, where miners had died from a mysterious sickness (actually, from lung cancer). It was thought that there was a place unfavorable for human habitation. Today, these places can be called geopathic zones. The parameters of these zones can be estimated, for example, with the activity of radium or radon in the soil, air, water or food.

It is proven, in the areas with a high content of radionuclides the increased morbidity and mortality from thyroid cancer, nasopharyngeal carcinoma, leukemia, lung cancer, and sarcoma can be observed. The manifestations of these factors of human exposure are always a complex process.

The objective indicators for the identification of such effects are the use of biological markers (the presence of specific types of micronucleus, chromosomal aberrations). They have a significant deviation from the background (stochastic) levels in some areas.

**RRG-05**

**DETERMINATION OF NATURAL RADIOACTIVE ELEMENT CONCENTRATION IN THE TERRA-ROSA OF MINIM-MARTAP DISTRICT AREA**

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The Minim-Martap district is a bauxite mineralized zone in the Adamawa region of Cameroon. It is the biggest Bauxite deposit in the country and possibly one of the largest in the world. It hosts about 40,000 inhabitants and its economic activity is Agriculture (such as – growing of food crops and animal husbandry) and it is free from industrial activities. However, the area is set to be a mining site for bauxite in the near future as exploration is ongoing.

Acute respiratory infection is one of the major causes of mortality and morbidity in the area. The infection is common among children and elderly people and usually results from the inhalation of polluted air by natural radioactive elements (CAL, 2010).

To this effect, the radioactive element (K, U and Th) content of Terra-Rosa samples in this zone was analyzed for possible risk to the inhabitants. The samples of 11 different locations collected from Cameroon were prepared at Akdeniz University by drying, grinding and homogenization, sieving through a 0.063 micron mesh and analyzed by the ACME Analytical Laboratories, Ltd using methods LF700 (for K) and LF100 (for U and Th). K had concentrations ranging from 0.01 – 0.3.wt% with a mean of 0.2 wt% and Std. of 0.1. U ranged between 2.8 – 7.4 ppb with a mean and Std. of 4.92 ppb and 1.42 respectively; while Th ranged from 19.8 – 33.2 ppm with mean and Std. of 27.15 ppm and 4.30 respectively.

Th and U are a multiple of 3.67 and 1.76 respectively, higher than the mean average value while K is lower by a multiple of 0.16. The gradient ratio of the slope of Th/U; K/U and K on Th were 4.13, 0.03 and 0.02 respectively. Indicating a slightly higher value for Th/U, that needs further investigation to determine possible radioactive activities. Correlative relationship between the concentrations of U and Th versus K; and U versus Th were 0.614, -0.256 and 0.521 respectively.

The high anomaly of the thorium in the study area may be one of the causes of the health problems by the radioactive, needs to be further investigated.

**RRG-06**

**WHICH ENVIRONMENTAL FACTOR IS CORRELATED WITH THE LONG-TERM MULTIPLE SCLEROSIS INCIDENCE TRENDS: ULTRA-VIOLET B RADIATION OR GEOMAGNETIC DISTURBANCE?**

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The actual nature of the environmental risk factor(s) of multiple sclerosis (MS) is still subject of debate. Received ultra-violet (UV) B radiation and geomagnetic disturbances both are solar-terrestrial phenomenon. Insufficient received UV is regarded the main environmental risk factor (RF) for MS in vitamin D deficiency hypothesis (VDEH). Nevertheless, geomagnetic disturbances (GMD) have also been proposed recently as a potential trigger for MS in the GMD hypothesis. The aim of this study was to investigate which of these mentioned RF is correlated with long-term ultra-decadal MS incidence. For conducting this study, three sets of data including long-term MS incidence data, long-term GMD data and long-term local received UV data were needed. The PubMed was searched to find studies with reported “annual incidence of MS” for at least 20 consecutive years, from high latitude European countries. Accordingly, six published reports including long-term incidence reports of the United Kingdom 1909-2010, Denmark 1950-89, Tayside County (Scotland) 1970-99, Norfolk County (Norway) 1979-2009, the Orkney islands (Scotland) 1941-82 and the Shetland Islands (Scotland) 1938-85 were selected for this retrospective time-series study. Ap index data, as the main GMD index, were extracted from Goddard space flight center and geomagnetic indices database of National Geophysical Data Center. Two sources were used for obtaining long-term local received UV data: the PROMOTE UV record and the COST 726 project. Possible lead-lag relationships between mentioned variables were evaluated by cross-correlation analysis for lags between 0 and 5 years. Significant positive correlations between Ap (GMD index) and MS incidence was seen in Orkney (at lag of 2 year: r = 0.41, p<0.05), Tayside county (at lag of 1 year: r = 0.37, p<0.05) and The UK (at lag of 0 to 1 year: r = 0.49, p<0.05). No correlation was found between the received UV and MS incidences in the studied locations. This study found significant positive correlation between alterations in GMD with long-term MS incidence in four out of six (66%) studied locations. In contrast, received UV alterations were not correlated with MS incidence in the studied locations. Based on the results, this study supports the GMD hypothesis about MS and indicates that GMD may potentially be the main environmental RF for MS. This new hypothesis deserves to be more be considered by MS researchers.

**SECTION: SOILS IN MEDICAL GEOLOGY AND ENVIRONMENTAL GEOCHEMISTRY (S)**

**S-01**

**GEOCHEMISTRY AND THE LIFE OF HUMAN SOCIETY**

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During formation of various types of living organisms they have developed a kind of “habit” to accumulate some form of chemical elements distributed in the geological environment at homeland. First, in terms of trace elements which are distributed in the lithosphere extremely heterogeneous. Gradually, such a “habit” it became a genetic trait that determines the nature of life. The development of adaptive reactions of living organisms to geochemical conditions of the environment and certain concentrations of chemical elements in it is the most important characteristic of the organization of the biosphere.

The active centers of many enzymes are metal ions, which determine the characteristic features of living organisms, primarily that of the highest mammals, in particular humans. A wide range of metalloenzymes detects the passage of many physiological processes, and it is safe to assume that the occurrence of certain biochemical differences in ethnic groups and their behavioral characteristics are related to the geochemical characteristics of the geological environment in their homeland.

However, based on the principles of geochemical isomorphism, the ion of any element, especially with its lack in the environment, later can be replaced by an ion of another element which is close to him in size, charge and nature of the chemical bond. A sharing spectrum of possible isomorph substitutions leads to a decrease, and often stop of the activity of some enzyme, and, consequently, to disruption of physiological processes in the human body, that is to change of its behaviour and even disease. Isomorphic substitutions of chemical elements in living tissues, associated with the variability of the geochemical composition of the living environment are an important factor in determining a person’s vitality.

In the urban environment, especially in large cities, there is an accumulation of many trace elements in the water, air, soils. The general indicators of the variability of chemical composition of the environment are soils and sediments of water reservoirs. Therefore, their geochemical study and correlation with statistics on morbidity is one of the priority areas of environmental geochemistry and medical geology.

Radioactive isotopes are the important geochemical aspect of the conditions of life. Considering that ionizing radiation is an important mutagenic factor that is evident even over a short period of time, during millions of years in parts of the lithosphere which was highly rich in radioactive elements and could cause mutagenic effects, the Homo sapiens may have formed the background of quiet evolution of primates. It can be assumed that the influence of radioactive elements in combination with other geochemical characteristics is also manifested in the development in certain geological territories of ethnic groups with different genetic traits and behavioral characteristics. From the point of view of the problems of the modern world, the most dangerous is the possibility of isomorph substitution between biophile elements which involved in physiological processes and man-made radioactive isotopes.

In general, the impact of geological-geochemical peculiarities of the environment on the life of society can be formulated as follows. The relationship of all processes that shape our planet applies and to the biosphere and the noosphere as spheres of the Earth, as the results of endogenous and exogenous natural and natural-technogenic processes on our planet. They display at different levels of development of human civilization – from the emergence of Homo sapiens, ethnogenesis, the evolution of human society up to the viability of individuals.
S-02
FACTORS CONTROLLING THE POTENTIAL OF ARSENIC OF SOILS WITHIN KONYA SETTLEMENT
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In many studies As, Cd, Cr, Hg, Pb and Ni were certainly accepted as toxic element however some others such as Mn, Be, V, Al, Zn, Cu and Fe are included among elements in some studies. In this study, factors controlling the distribution of arsenic of the soils around the Konya settlement area have been evaluated. According to parametric and multi-variate statistical analysis eight factors controlling the element distribution. The first factor has caused a 35.0% change in soils, second factor 17.32%, third factor 9.96%, fourth 9.65%, fifth 5.58%, sixth 4.87%, seventh 3.89% and the eighth one has caused a 3.64% of total variation. Arsenic distribution is controlled by the third and the seventh factors. The third factor shows that the minerals, forming based on the young volcanic activities, belonging to hydrothermal mineralization have disintegrated and that the toxic metals have been released. The seventh factor shows that the toxic metals have been released within a solid waste storage facility and some former military activities. Arsenic is used as a pesticide in agriculture while it is used in defense industry, so arsenic distribution in the area of investigation has been examined depending not only on natural geological factors but also on anthropological activities resting on agricultural, military and defense industry.

S-03
GEOCHEMICAL ASSESSMENT OF HEAVY METALS IN WETLAND SEDIMENTS FROM AROUND MARYLAND AREA OF LAGOS, SOUTHERN NIGERIA
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Wetlands are sinks for heavy metals thus they are important in ascertaining the pollution status of a catchment area. This study was designed to investigate the sources and contamination level of some heavy metals with depth in wetland sediments from Maryland, Lagos. Eight core samples were obtained from the wetlands and each were sub-divided into six 5cm intervals. The samples were dried, prepared and analysed using ICP-MS for elemental determination while the mineralogical constituents were determined using XRD. The physico-chemical parameters (pH, TDS and EC) of the samples soaked in deionized water were also determined. The pollution status for the selected metals was evaluated using Enrichment Factor, Geo-accumulation index, Contamination Degree and Pollution Load Index. Metal associations were determined using Correlation and Factor analyses. The results revealed that the metal load for Pb, Cu, Zn and Cd surpasses their natural background value, thus the area is said to be polluted with these metals. This is attributed to indiscriminate waste disposal from households, commercial activities and agricultural effluents from the catchments. The current status of the wetland sediments is of concern as these wetlands are used for dry seasons cultivation of vegetables and other crops. The possibility for the bio-absorption of these metals by these crops is huge thus introducing a pathway for the metals into the food chains. The consumption of these food products could trigger adverse health effects such as disruption of vital body organs. Thus, an immediate intervention to ameliorate the pollution in this area is imperative.

S-04
IMPACT OF FLY ASH DISPOSAL ON SOIL, AND GROUNDWATER QUALITY IN PARTS OF CENTRAL GANGA PLAIN, INDIA: A CASE STUDY
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The present study focused on the effect of fly ash disposal on agricultural soil and groundwater quality in agricultural and irrigational purposes around Harauzangar Thermal Power Station (HTPS) Allahgarh, India. 

The disposal of fly ash can bring about extensive changes in surface and ground water quality and cause soil pollution that can potentially adversely affect public health and land use practices. Systematic ground water sampling (n=27) was carried out to assess major ion chemistry. The chemical and physical parameters of groundwater samples, i.e., pH, electrical conductivity (EC), total dissolved solids (TDS), cations (Ca2+, Mg2+, Na+, K+) and anions (Cl-, HCO3-, SO42-, NO3-) were analyzed. The results exhibit the slightly alkaline nature of the water with alkalins as the dominant cations and Cl- > SO42- in abundance over bicarbonate amongst the anions. There is a strong correlation between TDS and other major ions such as Mg2+ (r = 0.51), Na+ (r = 0.64), K (r = 0.61) and HCO3 (r = 0.73). In this study area, four major hydrochemical facies have been identified as, Ca2+-Mg2+-SO42- type, Ca2+-Mg2+-HCO3 type and Na+ > Cl- > SO42- type. 

According to Gibb’s ratio 1 & 2, most of the groundwater samples are characterized as rock dominance, which suggests the chemistry of groundwater of the area is mainly influenced by the interaction between aquifer lithology and groundwater. To identify the changes in soil mineralogy caused by fly ash disposal in the vicinity of thermal power plant, bulk XRD analysis has been carried out on agricultural soil samples (n=10). Soil XRD spectra showed negligible changes in soil mineralogy because of fly ash. Based on the analytical results, irrigation quality parameters like sodium adsorption ratio (SAR), residual sodium carbonate (RSC), base exchange index (BEI), metasomatic indices (MGI), Kelly’s index (KI), maghemite hazard (MH) and permeability index (P) have been calculated, which indicate that the groundwater is mostly suitable for irrigation purposes.

S-05
ACCUMULATION OF HEAVY METALS (Ni, Cu, Cd, Cr, Pb, Zn, Fe) IN THE SOIL, WATER AND VEGETABLES COLLECTED FROM MIGORI GOLD MINES VICINITY, KENYA
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Heavy metals are reported worldwide as bio accumulable as well as bio transmissible by both natural and anthropogenic sources such as mining and agriculturally activities. The contamination of soils and drinking water by heavy metals is a major worldwide crisis threatening both the environment and mankind health. There is urgent need to address the heavy metal contamination in the environment because heavy metals are not biodegradable and do not pass into the organisms. The heavy metals are extremely toxic to both plant and animal life including human beings. This paper reports on the estimation levels of heavy metals in edible leafy vegetables, water and soil of Migori mining area, Sana Sub-County, Migori County, Kenya. Water samples were collected at random from the surface streams and River Migori in Migori County. About 42 soil samples and 42 leaf samples were collected at random in the small scale gold mining area. Four different types of common edible vegetables namely: Kale (Brassica oleracea (capsicola)), Spinach (Spinacia oleracea), Amaranth (Amaranthus cruentus) and Solanum spp (African nightshade) were also collected from the same study area. Heavy metals in water, soils and common edible leafy parts of vegetable samples were analyzed. 

The study showed that there is heavy metal contamination in the environmental media and this poses a grave situation for the consumers of the vegetables and other possible food stuffs grown on the soils. The research besides recommending educational awareness for the residents, recommended and started bioremediation using local plants.

S-06
IMPACT OF HUMIC ACID FOR THE DIVERSITY OF MICROORGANISMS INVOLVED IN THE BIODEGRADATION OF PENTACHLOROPHENOL IN SOILS
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Pentachlorophenol (PCP) as a ‘priority pollutant’ is widespread in soils, water and sediments, as well as in humus and other living organisms, and this compound remains a critical environmental concern because of its accumulation and negative impact on human health. Soil microorganisms play crucial roles in the fates of PCP, and understanding the behavior of these microorganisms is critical for the bioremediation of PCP-contaminated area. Humic substances (HS) are ubiquitous in soils, and can be reversibly oxidized and reduced through acting as redox mediators, to participate in microbial metabolism and impact a direct effect on the bio-degradation of organic pollutants. However, the roles of HS on specific microbial taxa that are responsible for PCP degradation remains unclear. In this work, the effect of three humic acids (HAs), extracted from forest (CBHA), paddy (PSHA) and peat (YNHA) soils, respectively, on the microbial community involved in PCP aneurobic mineralization were investigated by stable isotope probing (SIP) and high throughput sequencing methods. The results showed that all HA samples accelerated the biotransformation processes of PCP, in which the highest rate was obtained when with the HA extracted from the peat soil. The Illumina sequencing revealed that Desulfovibrio and Clostridium were the dominant function bacteria for PCP dechlorination. In the followed further degradation and mineralization of PCP, HAs had a substantial effect on the diversity and abundance of microbial communities and several phylotypes were enriched in the 13C heavy fractions compared to the 12C heavy fractions. Without HA, Methano- bacterium and Spartobacteria exhibited great increase in 13C heavy fractions. Methanosarcina
and OP1 were found to be the dominant PCP degraders in microcosms when amended with CBIA, whereas Burkholderia and Methanothrix were the key PCP degraders in PSHSA and YHNA-amended experimental microcosms. These findings provide scientific supports for developing in situ bioremediation technologies for the HSs-rich soils contaminated by PCP.

S-07 COMPARATIVE CHEMICAL ANALYSIS AND MINERALOGY OF THE SOILS EATEN BY UNGULATES IN SIKHOTE-ALIN AND CAUCASUS MOUNTAINS

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Introduction. Geophagy, or purposeful consumption of mineral substances, has been well-studied and documented among humans and animals worldwide (Young, 2010). The use of mineral licks has been marked among numerous species of mammals, especially ungulates (Rice, 2010). Currently, there are several biological explanations for this phenomenon, but all of them are overlooked by geological aspect of the problem.

Therefore, this investigation focuses on comparing chemical and mineral composition of soil-samples from mineral licks located in Sikhote-Alin and Caucasus Mountains and geological substantiation of possible reasons for it.

Methods and Materials. Samples of licked soil were collected in two places: Sikhote-Alin Biosphere Reserve and Caucasian Biosphere Reserve. Investigated areas have different climate conditions and geological structure, but despite this, both reserves contain mineral licks visited by Siberian stags (Cervus elaphus sibiricus) and Mountain goats (Capra caucasica), respectively.

Chemical and X-ray tests of soil-samples were conducted in the laboratories of Geological Faculty of Moscow State University and the Pacific Institute of Geography of the Russian Academy of Sciences.

Results and discussion. Investigations were able to identify similar features of consumed soils from both of studied areas:

1) Presence of plenty natural adsorbents, such as zeolites, clays and silica.
2) Soil-samples are characterized by a high content of trace elements (under the leadership of the light lanthanides).
3) All analyzed soil-samples contain low levels of water-soluble sodium salts.

In this way, it’ll be reasonable to assume two hypotheses of geophagy in studied areas: 1) adsorption - the consumption of mineral adsorbents for detoxification; 2) microelements - consumed soil is attractive because of the high amount of microelements in its composition.

Conclusion. The formation of mineral material, consumed by animals, arises in the process of bedrock’s physical, chemical and biological weathering. Bedrock’s composition (which depends on geology and climate of studying areas) will determine the final chemical and mineral composition of consumed soils and their attraction for animals.

Suchwise, mineral licks present an essential condition for the existence of wild animals and take a significant part in ecosystems.

S-08 PLANT UPTAKE OF AU IN AGRICULTURAL SOILS AMENDED WITH AU NANOPARTICLES OR HAULC: ROLE OF SOIL GEOCHEMISTRY

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There are major uncertainties related to the fate of engineered nanoparticles (NPs) in soils. Recent studies suggest that the availability of NPs in soil cannot be fully explained on the basis of common soil-solution partition processes as for ionic metals.

In this study a pot experiment with 3 agricultural soils of variable properties (pH=4.6±6.9; OC=1.7-7.2; clay=2-15%; 500g of soil per pot) was performed to identify the degree to which Au from AuNPs or HAuCl₄ solution added to soils under environmentally relevant conditions (i.e. aerated soils) was available for plant uptake.

Pots were amended with a suspension of AuNPs ([Au]=18.5 mg L⁻¹) or HAuCl₄ solution ([Au]=18.4 mg L⁻¹) and kept for 30 days at constant moisture content (70 % of WHC). After this, seeds of Lactuca sativa were planted. Plants were grown for 21 days after 50 % emergence of the seedlings in the control pots. Emerged plants were harvested, dried and analysed for total Au concentration (OECD 208 guideline).

All pots were equipped with probes for pore water sampling. The soil-pore water distribution of Au added to soils were monitored throughout the experiment. At the end of the experiment, soils from pots were separated in 2 sub-samples (0-5 and 5-10 cm of depth), dried and analysed for total Au concentration.

In this presentation results obtained for AuNPs amendment will be compared to those obtained for Au added to soil in ionic form. Differences in the distribution of Au in the soil profile and in the uptake of Au from soil by plants will be reported. The effect of soil properties as well as of non-equilibrium processes will also be discussed.

Acknowledgments. S. Rodrigues acknowledges the financial support of both FCT and “Compete” through Project nº IF/01637/2013/CP1162/CT0021. Thanks are due, for the financial support to CESAM (UID/AMB/50017), to FCT/MEC through national funds, and to the co-funding by the FEDER, within the PT2020 Partnership Agreement and Compete 2020 (project reference: POCI-01-0145-FEDER-016749 and PTDC/AGR-PRO/0262/2014).

S-09 BIOLOGICAL MARKERS OF AGROCHEMICALS IN SOILS AND PLANTS OF SOILS AMENDED WITH GOLD NANO-PARTICLES

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In this study, the effect of the iron deposits, located in Menteş watershed on the ground waters was investigated. The study area is located in the Seyhan river main basin. The Menteş watershed covers an area of 43 km² with an annual average precipitation of 460 mm/year. The study area comprises Precambrian metasediments, Lower Cambrian quartzite, Middle Cambrian recrystallized limestone, Ordovician metatulchites, Miocene conglomerate and recent alluvium. Recrystallized limestones are main aquifers within the studied area. To determine aquifer parameters totally 15 ground-water samples were taken from springs and wells in dry and wet seasons. T, pH and EC values were

WHI-01 MACRO- AND MICROLEVEL COMPOSITION OF GROUNDWATERS OF THE REPUBLIC OF BELARUS AND THE POPULATION HEALTH: PROSPECTS FOR SCIENTIFIC RESEARCH AND SANITARY REGULATION

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The evaluation of Belarus water resources had shown that in the future there is a possibility for universal provision of the population with quality and safe ground drinking water. As a result the main challenges in this regard are not only due to the natural groundwater characteristics but mostly due to anthropogenic pollution in the water transport process and transportation through water pipes. In the last years one more aspect - provision of the population with not only safe but also physiologically valuable drinking water became a point for consideration.

Despite drinking water is not a major source of essential elements its added value into the total macro- and micronutrients contribution has been significant scientifically proven and worldwide recognized fact. Even their relatively minor intake with drinking water may play a crucial protective role because these elements present in water as free ions and easier absorbed in comparison to that from food. The lack of essential elements, low mineralization and hardness of drinking water can contribute to eczema, coronary heart disease, hypertension and other diseases development. At the same time, with the right approach, drinking water may help to compensate macro- and micronutrients lack occurring due to malnutrition, contribute to the hypertensiveness, cardiovascular class, carbohydrate group. At these waters calcium and bicarbonate ions are the major components (respectively 36 % and 48 % to the total salts quantity). The calcium content in drinking water varies from 10 to 140 mg/l (mostly in the concentrations 65 – 80 mg/L), the magnesium content – from 1 to 40 mg/l (mostly in the concentrations 15 – 20 mg/L). The prevalent anion in the drinking water is bicarbonate, its content vary from 50 to 450 mg/l (the most common value 170 – 280 mg/L). Chloride and sulfate ion contained in the concentrations up to 10 mg/L, maximum concentrations often close to the MPC (maximum 0.09 mg/l while the standard is 0.1 mg/l). The information database including information about macro- and micronutrients content in drinking water ground sources was developed.

On the basis of the obtained results, taking into account literature data, the existing development in this area, the physiological importance of basic macro – and microelements, as well as the potential uptake of specific elements with water the criteria of physiological value of drinking water (total mineralization, total hardness, calcium, magnesium, potassium, bicarbonate) and additional content of fluoride ion were developed and approved in SanFN. The differentiation of drinking water ground sources in accordance with these criteria was conducted at country level. The algorithm for selection of ground drinking waters sources taking into account criteria of drinking water physiological value was grounded.

WHI-02 HYDROGEOCHEMICAL CHARACTERISTICS OF GROUNDWATER IN MENTEŞ WATERSHED AND ENVIRONMENTAL IMPACTS (AYAHYALL- KAYSERI-TURKEY)

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In this study, the effect of the iron deposits, located in Menteş watershed on the ground waters was investigated. The study area is located in the Seyhan river main basin. The Menteş watershed covers an area of 43 km² with an annual average precipitation of 460 mm/year. The study area comprises Precambrian metasediments, Lower Cambrian quartzite, Middle Cambrian recrystallized limestone, Ordovician metatulchites, Miocene conglomerate and recent alluvium. Recrystallized limestones are main aquifers within the studied area. To determine aquifer parameters totally 15 ground-water samples were taken from springs and wells in dry and wet seasons. T, pH and EC values were

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measured in-situ and the major anion – cation and trace element analysis were done. Temperature of the waters ranged from 7oC and 19 oC; pH values ranged from 7.26 and 8.7; EC values ranged from 47.3 μS/cm and 642 μS/cm. The cation and anion sequencing of the water samples are mostly in rCa>rMg>rNa>rK and rHCO3>rSO4>rCl form, respectively and this sequencing indicate that the groundwater are predominantly located within the limestone and dolomite. δ18O (‰–10.93 – 1.88‰) and δD (‰–51.29 – 15.27‰) values show that waters are meteoric origin. The major anion and cation values of the water samples are below the drinking water limit values (TS 266 and WHO). Trace element analysis covering 66 parameters were analyzed by ICP-MS method and more than 30 elements including Hg, Cd, Th and Ag stayed in below detection limits. As, B, Co, Cr, Cu, Mo, Ni, Pb, Sh, Te, U, V, Zn, Se and other elements’ values are low enough to be ignored. The obtained results showed that ground waters located in Yahyali iron mine fields and its close vicinity have drinking water quality and they do not affect by the mining activities.

WHH-03

GEOLICAL ENVIRONMENT AND GROUNDWATER QUALITY, A KEY TO SOCIAL DEVELOPMENT: THE BINOMIAL SOUTHERN EDGE OF THE DUERO BASIN SPANISH CENTRAL SYSTEM, SPAIN

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It is a social challenge to establish the link between the geological and health environment and the laws that govern this relationship to improve the quality of life and the relationship of Man with his environment.

Groundwater is one of the means that best establishes this relationship. As an example, a sedimentary basin associated to fissured aquifer is presented: the binomial southern edge of the Duero Basin-Spanish Central System. The geology, and especially the structure of fissured aquifers recharging laterally and from the basement sedimentary basin, control groundwater quality in the basin, especially in terms of concentrations of Potentially Toxic Geogenic Trace Elements (PTGTE). Distribution of As, V, and Cr in the groundwater of the Duero Basin is regulated mainly by structural factors and particularly by inputs of cold-hydrothermal waters flowing through fractures of the basement.

Groundwater quality is determined by the geological and hydrogeological conditions, which is a complex and dynamic system conditioned by the geological and tectonic conditions, and the environmental evolution. Despite the importance of groundwater as a resource, its quality can be affected by human activities, such as the use of fertilizers and pesticides, which can contaminate the water and affect its quality.

WHI-04

CORRELATION BETWEEN WATER EEDS LEVELS AND OCCURRENCE OF PCOS IN CHENGDU, CHINA

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Table 1. The prevalences of PCOS and concentrations of water EEDs and serum EEDs in three districts, Chengdu

<table>
<thead>
<tr>
<th>District</th>
<th>Prevalence of PCOS</th>
<th>EEDs in serum (ppb)</th>
<th>EEDs in water (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qingyang</td>
<td>6.0%</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>Jinniu</td>
<td>6.8%</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>Wuhou</td>
<td>9.2%</td>
<td>0.004</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Concentration of PCOS and trace elements in water and serum EEDs levels from three districts of Chengdu. The prevalence of PCOS increased in the following order: Jinniu > Wuhou > Qingyang. The average concentration of EEDs in water and serum were the highest in Wuhou, followed by Jinniu and Qingyang. The correlation between water EEDs levels and occurrence of PCOS in the three districts showed that the prevalence of PCOS increased with the increase of EEDs levels in water and serum.

WHI-06

IMPACT OF THE WATER WHICH LACK ELEMENT OF IODIUM AGAINST PUBLIC HEALTH IN BALONG AND JAMBON PONOROGO EAST JAVA PROVINCE OF INDONESIA

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Data and information as well as the literature, in the Subdistrict of Balong and Jambon Ponorogo, East Java province, there is a village call Karang Patihan with four hamlets, namely Tangunggrejo; Krajan; Bibis and Bendo, residents in the village of which a fraction suffer diseases is iodine deficiency. Morphology the area located on the northern slope of the hills more than 40%, so estimated minerals needed by the human body is a lot of erosion by streams of rain water, as well as its location is isolated from the urban area so the distribution of nutritious foods often have difficulty.

The results of the analysis samples of water that comes from the well, river water and spring water are as follows: wells: (SG-1; SG-2; SG-3; SG-4; SG-5) is = 26 ug/L. In the drilling (SB-1) is = 44 ug/L. river water (AS-1; AS-2) is = 0 ug/L and spring water (MA-1) was also = 32 ug/L. all elements of the content of iodium less than 50 ug/L. Where as the needs of iodium per day for health is = 150 – 200 ug/L.

The results of the information from the local Health Department, the diseases shortage of Iodium Don Tanjunggrejo is 6 people; chronic 4 people. Don. Krajian is 8 people; chronic 1 person. Don. Bibis. Is 8 people; chronic 1 person; Don. Bendo is 6 people; the chronic 1 person, and the total is = 89 people.

To improve the quality of health care for the local population, improvement of nutrition and extra salt iodium to be given regularly by the local Health Department so that the next generation of the society will live more healthy and prosperous.
approximately 1.2 million people in Sweden rely on private drinking wells as their sole water source. In addition to pollution from anthropogenic sources, ground water is also greatly affected by the underlying bedrock. Moreover, compared to municipal drinking water, water from private wells was previously under treated and of poorer quality control. A large study investigated the presence of lead and cadmium in the water from private drinking wells outside the city of Höör in the county of Scania, Sweden. The investigated area is located within the Songesfors-Tornquist zone with known fractional mineralization of Galena and Sphalerite. Results showed that 18% of the 692 available drinking wells included drinking water samples with lead and/or cadmium exceeding the Swedish drinking water guidelines. In certain cases, highly elevated levels of lead (>100 μg/l) as well as cadmium (>30 μg/l) were detected. Analysis of blood samples from highly exposed individuals in several cases showed blood lead levels exceeding the US EPA action limit of 50 μg/l, a level that has previously been shown to impair cognitive functions in children. A clear correlation could also be observed between lead concentrations in water and in blood (R² = 0.782). This study hence demonstrates that the local geological conditions can give rise to exposure to heavy metals via private drinking wells at concentrations, which on a long term could be associated with adverse health effects.

**WHH-08**

**IMPACT OF DEFICIT CONTENTS OF CALCIUM AND MAGNESIUM IN GROUNDWATER/DRINKING WATER ON HEALTH STATUS OF INHABITANTS, SLOVAK REPUBLIC**

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This work aims to evaluate the impact of chemical composition of groundwater/drinking water on health status of inhabitants in the Slovak Republic. Primary data consist of the Slovak national database of groundwater analyses (20,339 chemical analyses, 34 chemical elements/compounds) and data on health status and demographic growth of Slovak population (health indicators - HI), covering the whole Slovak territory and population (approximately 50,000 sqkm, 5,500,000 millions of inhabitants). Fourteen HI were evaluated including life expectancy at birth, potential years of lost life, relative and standardized mortality for the most common causes of deaths in the Slovak Republic: cardiovascular and oncological diseases, diseases of gastrointestinal and respiratory system. The chemical and health data were unified in the same form and expressed as the mean values for each of 2,883 municipalities within the Slovak Republic for further analysis. Pearson and Spearman correlation as well as method of artificial neural network (ANN) was used as mathematical method for environmental and health data analysis. Based on the results of calculations through ANN, the most significant chemical elements having influence on evaluated HI were identified together with their limit values. The following chemical elements/parameters in the groundwater were defined as significant: Ca²⁺ + Mg²⁺ (mmol/l), Ca²⁺, Mg²⁺, TDS, HCO₃⁻ and SO₄²⁻. The most significant relationship between HI and chemical composition of groundwater was documented for Ca²⁺ + Mg²⁺ (mmol/l), Ca²⁺ and Mg²⁺. The following limit values were set for lead and/or cadmium exceeding the Swedish drinking water guidelines. In certain cases, highly elevated levels of lead (>100 μg/l) as well as cadmium (>30 μg/l) were detected. Analysis of blood samples from highly exposed individuals in several cases showed blood lead levels exceeding the US EPA action limit of 50 μg/l, a level that has previously been shown to impair cognitive functions in children. A clear correlation could also be observed between lead concentrations in water and in blood (R² = 0.782). This study hence demonstrates that the local geological conditions can give rise to exposure to heavy metals via private drinking wells at concentrations, which on a long term could be associated with adverse health effects.

**WHH-09**

**RECOVERY HISTORY AND PROVANCE OF SALINITY IN THE AQUIFER SYSTEMS OF YUNCHENG BASIN, NORTHERN CHINA**

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A combination of environmental isotopes and chemical compositions of groundwater was used to characterize the recharge history and improve the current knowledge of groundwater salinization in arid/semi-arid region. Field investigations were conducted in Yuncheng Basin, northern China, where extensive pumping occurred for agriculture and domestic supply. Groundwater from shallow and deep aquifers was characterized by distinctive stable isotopes and ^1³C activities. Shallow groundwater had ^1³C activities (up to 87 ppmC) and δ¹⁸O, δ²H values, similar to those in rainfall sample. This gave evidence that groundwater recharge was going on. However, depleted stable isotope compositions in the deep aquifier, together with the very low ^1³C (~< 20 ppmC) indicated recharge during the late Pleistocene period (~10 to 16 ka B.P.). Approximately 60% of the samples from the shallow and 35% of the samples from the deep aquifers had TDS above 1 g/L. This suggested a large-scale groundwater deterioration in this study area. Results of stable isotopes, ¹³C ratio, and saturation indices illustrated the major geochromical processes responsible for groundwater salinization included dissolution of evaporates, cation exchange and evapotranspiration. Leakage from the salt lake was a local process only affecting shallow groundwater in the northern shore of the lake. As indicated by the Ci/Br ratios, δ¹⁸O values and calculation from Gordon-Craig model, intrusion of an evaporated palaeo-saline water was a noteworthy factor in the formation of deep groundwater. Using a Rayleigh distillation model, we found that the groundwater chemistry in the deep aquifer was also modified by sulfate reduction.

**SECTION:**

**MINERAL AND HYDROMINERAL HEALING RESOURCES. HISTORICAL AND MODERN ASPECTS OF THEIR USE IN MEDICAL PRACTICE (MHHR)**

**MHHR-01**

**HYDROCHEMICAL AND HEALTH EVALUATION OF THE THERMAL AND MINERALIZED WATERS IN GAZLIGÖL (AFYON)**

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Since the early ages, hot and mineral water resources have been used by many people to heal many diseases. Paleozoic and Mesozoic aged rocks are located in the study area. The Paleozoic aged metamorphic schists cover large area and include quartzites in some places. Neogene aged sediments are unconformably over line by the Paleozoic aged metamorphic schists. Waters can be seen around Gazlıgöl. They are located along NE-SW, N-S directed normal faults. Temperatures of the springs and drill wells are in between 32-74 °C and discharge rates are 0.1-2.8 l/s and total mineralization (TDS) 350-4000mg/l respectively. Thermal and mineralized hot springs have gas bubbles. As a result of the analyses it was understood that there was no H₂S, so it should be CO₂. Gazlıgöl thermal and mineralized waters are Na-HCO₃ type hot and mineral waters. According to Association of international Hydrogeologists, thermal waters can be classified as sodium-bicarbonate rich hot water. The dominant ions in the waters are Na⁺ + K and HCO₃⁻. The waters are saturated with bicarbonate, B, Mn and Fe are in hot and mineral waters exceed the limit values.

Gazlıgöl hot and mineral waters are used for health and treatment purposes. The Gazlıgöl spa is effective on the especially rheumatismal, gynecological and abdominal diseases. The Gazlıgöl spa has the capacity of 2000 bath/person/day. More over because of the water mineralization is high TDS value, it is very important for thermal tourism. Balneology uses thermal waters at 38-42°C temperature can be used for therapeutic purposes. Thermal water containing high level of dissolved carbon dioxide, TDS and sulphur values are used in the treatment of skin diseases.

**MHHR-02**

**ARSENIC BIOGEOCHEMISTRY IN HOT SPRINGS IN TENGCHONG GEOTHERMAL AREA, CHINA**

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Arsenic (As) is a ubiquitous toxicant and carcinogen in natural environments. High concentrations of arsenic were generally found in geothermal systems. Natural discharge of geothermal fluids with high As posed potential environmental risks. Microorganisms play important roles in arsenic transformation and mobilization in geothermal fluids. However, microbiologically-mediated As environmental geochemistry in geothermal system has yet to be fully understood. Hot springs provide unique environments for the evolution and establishment of microbial communities and their response to various biogeochemical and metabolic processes involving hydrogen (H₂), sulfur (S), iron (Fe) and arsenic (As). In this study, arsenic environmental geochemistry mediated by microorganisms in Tengchong geothermal area of Yunnan, China, was studied with an integrated approaches including geochemistry, 16S rRNA gene Illumina MiSeq sequencing, functional gene clone libraries, Q-PCR, enrichments and isolates cultures.

In the pool of Zhenshanhu, the remarkably high ratios of As(V)/As(III) (0.73-0.86) suggested that As(III) oxidation occurred at the discharge source, which were distinctly different with previous studies that As(III) was predominated in the source water of those acid sulfate-CI hot springs. Compared to previous acid sulfate-CI hot springs with sulfide concentrations of 2.02-12.6 mg/L, the distinctly low concentrations of sulfide (0.03-0.05 mg/L) in the pool provided a prerequisite for microbial As(III) oxidation. Clone libraries of aoxA gene demonstrated the presence of several groups of As(III)-oxidizing microorganisms in the pool, including a few unidentified families of Aquificae and some postulated archaea. Furthermore, based on high 16S sequences similarity with As(III) oxidizing bacteria from geothermal and other environments, Pseudomonas and Rubidobacter inhabited the pool might be also related to As oxidation. Coupled
with iron and sulfur oxidation along the outflow channel, arsenic was substantially accumulated in downstream sediments, with As concentrations up to 16.44 μg/kg and AsFe mole ratios up to 6.72. These were significantly higher that those in previous acidic sulfate-CI hot springs (AsFe mole ratios: 0.60 to 0.74). Previous studies documented the clay minerals in geothermal area, such as smectite and kaolinite, could host As concentrations up to 4 μg/kg. Coincidentally, smectite and kaolinites were also detected in the downstream sediments of Zhenuzhuan by X-ray diffraction, which suggested that As in downstream sediments might be also adsorbed on the clay minerals, except for common iron minerals.

AsFe concentrations significantly increased from 5.45 to 13.64 μmol/L along Zhenuzhuan outflow channel. Besides, elevated AsFe (III) from 0 m to 4 m and subsequent decreased with a corresponding increasing in As(V) from oxidation after 4 m, strongly suggested that fully-thiosulfate at this site was first converted to As(V) and then oxidized to As(V) after the thiosulfate disappears, as has been observed in previous studies (Planer-Friedrich et al. 2009). The reduced sulfur generated from thiosulfate transformation was oxidized to sulfite as DO increased after 4 m, which led to the increase of SFe (III) from 4m to 12m. Based on the As equilibrium observed in these hydrothermal fluids, the predominant As minerals, except for common iron minerals.

DNA, with an average of 1.52×10³ copies/ng DNA. Based on qPCR estimates of bacterial and archaeal 16S rDNA gene abundance, α-48 harboring organisms comprise as much as ~15% of the total community. Phylogenetically, the major α-48 sequences in the acidic hot springs (pH 3.3-4.4) are affiliated with Aquificales and Rhizobiales, while those in neutral or alkaline springs (pH 6.6-9.1) are inferred to be primarily bacteria related to Thermales and Bacteroidales. Two As(III)-oxidizing bacteria TCZ10 and TCC9-4 were isolated from two hot springs in Tengchong geothermal area. The strain TCC9-4 is a facultative chemolithoautotrophic bacterium, and could grow with As(III) as an energy source, CO₂/H₂CO₃, as a carbon source and oxygen as the electron acceptor in a minimal salts medium. Under chemolithotrophic condition, 1.33 mM As(III) could be oxidized by the strain TCC9-4 in 36 hours. Temperature is an important environmental factor that strongly influenced the As(III) oxidation rate and As(II) oxidase (Aio) activity. The highest As(III) oxidation rate (37.11 μM/hour) and Aio activity (0.037 U/mg) are found at the temperature of 40°C. Addition of 0.01 % yeast extract enhance the growth significantly, but delaye the As(III) oxidation. The strain TCZ10 is a heterotrophic bacterium, with temperature and pH optimum in growth being 68°C and 9.2. It can completely oxidize 2.5 mM As(III) and 5 mM As(V) in 36 h and 72 h at pH 9.2 respectively, with an averaged As(III) oxidation rate of 76.35 μM/hour (5.72 mg/L/hour). On the basis of 16S rDNA gene sequence analysis, strains TCC9-4 and TCZ10 are identified as the genera Arthrobacter and Geobacter in the phylum Firmicutes respectively.

MHHR-03

THERAPEUTIC MINERAL WATERS OF THE REPUBLIC OF TATARSTAN. SETTLEMENT AND SPREAD PATTERNS, PROBLEMS OF THEIR USE

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The medicinal mineral water of the Republic of Tatarstan (RT), until recently, have been underexplored yet. Meanwhile, geographical location, economic, geological and hydrogeological conditions of RT provide a basis to the extension of works on prospecting, exploration and exploitation of groundwater as a curative mineral with the prospect of sanatorium and health resort construction. The results of geological and hydrogeological studies in the subsolv of the Republic of Tatarstan it is possible to allocate 3 groups of mineral waters: the mineral waters without specific components and properties. They are associated with rocks of the upper part of geological section, have mineralization up to 4-5 g/dm³ and more and used as drinking medicinal-table, sometimes medicinal water; the hydrogen sulphide mineral water with different concentration of hydrogen sulphide; bromine and iodine-bromine sodium chloride and calcium-sodium brines. They are frequent in the rocks below depths of 300-500 m, have mineralization of more than 150 g/dm³ and used in the form of spa baths after dilution with fresh water.

There are 45 sanatoriums and resorts on the territory of the Republic of Tatarstan today. Historically the development of water resorts is given one with the use of these group of waters. 21 deposits of mineral waters were explored to date. Total reserves of water amount to 3.317 thousand m³/day. Almost all of these deposits are located in areas of large cities – Kazan, Naberezhnye Chelny, Yelabuga, Nizhnekamsk, Almetyevsk, Leninogorsk, where are large enterprises that can take on its balance sheet the development of these deposits. Today the task of conservation lies in the development of fields located far away from large settlements, which require significant capital investments.

A shining example of the use of private investment was the finding of Tarkhanskoe and Lukmanovskoe deposits of mineral waters in Tetyushskii district of RT. Conducted in 2011-2012 by order of the “Volga water and Co” LLC geological and hydrogeological studies allowed to identify a number of waters, which are specific not only for the regions of the Middle Volga, but for the regions of the Caucasus. Three aquifer system which confined to the Jurassic and upper Permian sediments were tested. The Jurassic sediments water are similar to “Kislovodskii” type and “Unokovskii” type and the upper Permian deposits underground water are similar to “Cheboksary” type of mineral waters, which was confirmed by the balneological conclusions. Another type of mineral water is an analogue of the “Achalkulskii” type, which was produced on Lukmanovskoe deposit. The main factor of formation of mineralization and chemical composition of these types of groundwater are rocks, first of all, their mineral composition and petrochemical peculiarities. At the present time with the means of “Volga water and Co” LLC on the deposit area a factory for bottled water filling was built. The water is sold retail.

The findings of Tarkhanskoe mineral water deposit allows for begin construction of the sanatorium and health resort complex and gives additional impuls to the development of the tourism industry in the ancient cities of Tatarstan as a Tetyush and Bolgar.

MHHR-04

THE USE OF MINERALS IN ARAB-islAMIC MEDIEVAL MEDICINE: EXAMPLES FROM “THE CANON OF MEDICINE” BY IBN SINA

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Medical benefits have constituted one of the characteristics, adopted by Muslim scholars in the definition of minerals and their identification, as it is clearly seen in the majority of books that have studied mineral species, and in many books on medicine and pharmacy, which focused on an inventory of single and compound drugs and described their compounds Properties.

In this paper, I limited myself to some extracts from a well-regarded medical source in the west: “The Canon of Medicine” by Ibn Sina (Avicenna: a very famous Muslim physician from the 11th century), and I have highlighted three important aspects of mineral uses in Arab-Islamic medical literature:

1. A great diversity of metals used in the synthesis of drugs as: copper, sulphate, copper sulphate, zinc sulphate, burned copper, slag silver, borax, vitriol, alum, pharomic glass, coral, pearl, chalk, amulet, halel, arnydate, ashtens, mercury, seasdell, cinnbar, lead, burned lead, lead filings, copper scrap, erose, lithage, calamine, anerie;

2. A large spectrum of medical specialties that use these medications as: urolithology, Internal diseases, urinary medicine and kidney diseases, skin diseases, ear diseases, cosmetics, cosmetic medicine, as well as the treatment of cancers, poisons, headache, sciatica, gout and arthritis pains;

3. And a multiplicity of medication forms prescribed: ointments, creams, bandages, snuffs, tablets or capsules, drops, powders, eyeliner, suppository and injections.

As metals health benefits and concerns form the two parts of medical geology, which represent an emerging and promising field of Earth Sciences in recent times. I stressed from “The canon of medicine” that Ibn Sina was not only interested by health benefits of minerals; but he was also aware of health problems that they can cause.

MHHR-05

NEW TRENDS IN PELOTHERAPY

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Conceptually the therapeutic interest for one type of healing mud called natural peloid, defined as a primary peloid or virgin peloid/naturally matured and applied at or near the natural site of occurrence, is mostly based on empirical evidences; otherwise the therapeutic interest for peloid s.s (stricto sensu), also called just peloid, in an healing mud or muddy suspension that is artificialized through manipulation (refining and beneficiation) and maturation in an artificial environment and appropriate conditions, is based on scientific evidences and applied under medical prescription and surveillance inside resort or other healthcare facilities (Gomes et al., 2013).

These days due to environmental and sanitary reasons herewith identified mud therapy based on the use of natural peloid is progressively losing interest in favour of pelotherapy or petotherapy based on peloid s.s particularly on those called designed and engineered peloids (Gomes et al., 2015). Designed and engineered peloids easily can be manufactured using, for instance, specific mixtures of one almost monomineralic and commercial clay (e.g., kaolinit or bentonite), preferably of pharmaceutical grade, with one specific mineral water (e.g., sea water and salt lake water) or natural mineral water (e.g., spring thermal water), that after undergoing procedures found to be relevant in the preparation of designed and engineered peloids and some examples of their application will be discussed and discussed.
RESIDUAL SMECTITIC CLAYS FROM SANTIAGO (CAPE VERDE): ASSESSMENT OF THEIR PROPERTIES FOR PELOTERAPY

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Samples from residual clays from Santa Cruz/Pedra Badajo, on the eastern part of the island, were submitted to chemical, mineralogical and technological characterizations, with particular emphasis on those allowing the assessment of the potentialities but also the risks for application as healing clays and as geoplastic materials. Local populations use, since long time ago, these clays for traditional topical and gastric treatments, without any type of scientific or technical control. The studied deposits correspond to small outcrops developed over old er volcanic formations. Several analyses were carried out: grain size distribution (wet sieving and sedigraph), mineralogical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasiveness, plasticity (consistency limits), cation exchange capacity and exchangeable cations, specific surface area, expandability, oil absorption and cooling rate. All the analyses had been carried in accordance with the protocols and norms followed in the Departments of Geosciences of the University of Aveiro and in the Pharmacy College of the University of Porto. The results obtained so far point to very fine materials (100% <6 μm), almost smectite pure (no quartz at all) and presenting a chemical composition compatible with the desired applications. The sample can be concluded from almost all of the technological tests, showing high values for the cation exchange capacity, plasticity, specific surface area and oil absorption, and low values for abrasiveness and cooling rate. SEM/EDAX analyses were also carried out to specify the smectites, revealing dioctahedral and trioctahedral Fe rich smectites, typical of weathering of volcanic rocks.

HYDROTHERMAL IN SITU MATURATION OF CLAYEY GEOMATERIALS (AZORES, PORTUGAL): ASSESSMENT OF THEIR PROPERTIES FOR MEDICAL USE OF TALAYA HEALTH RESORT WATER

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Caldeiras da Ribeira Grande fumarolic field includes a particular case of maturation in situ where sediments and mineral waters added with pluvial waters are constantly mixed in a very large pool. The peloids extracted from this boiling-mud pool are being used in a local thermal center, which exists since 1811, especially for the relief of pain associated with rheumatic diseases and for skin disorders treatment. This work aims the mineralogical and geochemical characterization of the peloids from the pool and, secondly, the establishment of a diagenetic mineralogical evolution. 11 sampling sites (inside the pool); Segmentation performed on samples that show clear visual heterogeneities; XRD analysis of the mineralization of the peloids samples was determined by X-ray diffraction (XRD); Geochemical characterization (using X-ray Fluorescence – XRF); Granulometric analyses were also carried out to specify the smectites, revealing dioctahedral and trioctahedral Fe rich smectites, typical of weathering of volcanic rocks.

CHEMICAL COMPOSITION AND SUITABILITY OF SOME TURKISH THERMAL MUDS USED AS PELOIDS

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Thermal muds have been using in many spas for different kinds of health diseases e.g. neuralgia, neuritis, polyneuritis, fractures, dislocations, etc. and cosmetic purposes since ancient times in Turkey. People use muds in different forms such as mud baths, masks and cataplasms to treat nearly all types of rheumatism as well as to cleanse and beautify of the skin. Peloid samples were taken from 11 spas, most of them in the north of Turkey. So far, there is no standard about the chemical composition of peloids of the suitability to therapy and/or causing health risk. Mineralogical and chemical composition and their possible toxicity of the peloids were investigated and compared with some commercial, pharmaceutical, and natural clays to interpret that they have any health risk or not and potentials applied for peloid therapeutic treatments, and to make recommendations of suitability of Turkish peloids.

The studied peloids are classified as neutral to slightly alkaline, with high electrical connectivity value have high chloride content and regarded as high conductive. Temperature of the peloids varies from 23.2 to 61 °C. The mineralogical and geochemical characterization of the peloid samples were determined using X-ray diffraction and chemical analysis. Mineralogical composition is composed mainly of smectite, illite, illite-smectite, partially quartz, and feldspar, some calcite, dolomite, amphibole silica, and rarely kaolinite, halite, serpentine, and glauccophane. Clay mineral content and types of sample samples and the most abundant clay mineral is Ca-montmorillonite. The major and trace element contents of the peloids are partially similar while toxic element content vary considerably. Major and trace element contents of the studied peloids are higher or lower than the commercial herbalist clay (CHC), pharmaceutical clay (PC), natural clay (NC), average clay (AV), and Canadian natural health products guide (NHPG). The toxicity of some elements (As, Cd, Co, Pb, and Sb) were compared especially pharmaceutical clay and evaluated together with other parameters. Though, the toxic elements are higher than PC in most of peloids, since these peloids have not been using for pharmaceutical purposes, therefore they will not be caused a risk in therapy.

Key words: Chemistry, peloid, therapy, toxicity, Turkey.
Elevated levels of fluoride (F−) in groundwaters of granitic and basaltic terrains is a worldwide environmental problem, which affects millions of people. Hydroxyapatite (Hap) has been shown to be a strong sorbent for F−; however, the molecular mechanisms have not been clearly addressed, owing to the lack of spectroscopic analysis. Here we provide a novel 19F solid-state NMR method to investigate the F− uptake mechanisms by synthetic nano-sized HAp. Our experiments showed that fluoride uptake mechanisms depend on pH concentration dependent. At pH 7 and fluoride concentration less than 50 mM, observation of a single 19F solid-state NMR peak at -103 ppm, which could be assigned to fluoroapatite (Ca10(PO4)6F2), suggested that fluoride substituted the tunnel hydroxyl group in the Hap structure. At higher fluoride concentration (e.g. 100 mM), two 19F NMR peaks were observed at -103 and -108 ppm. This suggests the formation of CaF2 precipitates (−109) and −108 ppm. Analysis with TEM and XRD further confirmed this finding, and indicates it is crystalized. Interestingly, we found that a much lower fluoride concentration (e.g. 10 mM) would induce the formation of CaF2 precipitates. In contrast, at pH 10, CaF2 precipitates did not form even at fluoride concentration up to 500 mM. This is attributed to the pH-dependent stability of Hap. The substitution mechanism at certain pH and fluoride concentration clearly interpreted the re-generation mechanism of Hap for defluorination, and demonstrate that Hap is an ideal material for high-fluoride groundwater remediation.

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Clay and mud, produced by rock transformation, have long been used as curable substances which have adsorptive, warming and anti-inflammatory properties. Clay, which is part of eumetamorphic, is rich in calcite and sandstones, is used to neutralize poisons in dermal and gynecologic diseases and the malfunction of the locomotor apparatus. The mineral and organic constituents of mud deposits have a profound influence on the human organism. Their adsorptive and warming effect help resist inflammatory processes of varied origin.

The mineral compositions and physico-chemical properties of curable muds and clays were analyzed and compared, using samples from some well-known deposits. Mud samples from the Dead Sea (Israel), Lake Tanganyika (Northern Region), and Lake Gokou (Karelia) and from Borovichi (Novgorod Region), Nikolaysky (Leningrad Region), Ladokhinsky (Karelia) and Tsvetnoy (Karelia) and kaolin (Ukraine) deposits and cosmetic products were used in our experiments.

The substance was studied using scanning electron microscopy (Vega Tescan microscope), X-ray phase analysis (ARLXTRA diffractometer), combined scattering spectroscopy (Nicolet Almega XP Dispersive Raman spectrometer), IR spectroscopy (Spectro M 80 spectrophotometer) and methods and methods for the study of thermophysical characteristics were employed. Our study has shown that:

1. There are differences in mineral and chemical composition. Mineral microinclusions indicate the genesis of mud and clay deposits.
2. The physico-chemical characteristics provide a quantitative basis for comparing clays and clays by their ability to stay on the skin, to retain heat and to adsorb useful and remove harmful substances.
3. Admixtures of fine talc-bearing rock fractions to muds and clays improves their heat-accumulating properties.

One of the types of natural radioactivity is a heavy inert radioactive gas radon, which is colorless, odorless, soluble in water [1], and may be detected in the environment. Radon sources are connected with uranium deposits, granite masses and tectonic zones. Isotopes of radon are formed by radioactive transformations of radium and give rise to new decay chains. The risk of human exposure from radon and its decay daughter products according to the UN is 43% [2], which makes monitoring of radon actual in different environments.

Seismic radon station CRS-05 is designed for monitoring radon, thoron and other parameters of the subsurface air and air of indoors. [3] SRS-05 station based into the soil can accumulate the data of measurements in the internal memory for a long time and transfer them to a computer connected to station in time intervals free from measurements. The goal of hardware and software complex is the expansion of communications capabilities of station as the remote control and the transfer of measurement data. These functions are implemented through a mini computer and communications devices, providing access to the Internet network and data transmission to separate users and to server.

SRS-05 station measures the volumetric activity of radon and thoron, pressure, temperature, humidity, battery voltage, which feed the station. Battery voltage for work of the station is 10.6-13.2 V. Due to the low consumption: in measurement mode current is 500 mA, in standby mode – 100 mA, the station can operate without recharging the battery for a few weeks. Minicomputer running under the Linux operating system. The core modules of the program are written in the Python programming language. Additional helper scripts are written in bash. The software of the complex works in three modes: obtaining data from the station with-granites and tectonic zones. Isotopes of radon actinon, radon, thoron are formed by radioactive transformations of radium and give rise to new decay chains. The risk of human exposure from radon and its decay daughter products according to the UN is 43% [2], which makes monitoring of radon actual in different environments.

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Figure 1. (a) Adsorption kinetics and (b) XPS spectra
Earth Cryosphere can be a source of unique biological resources, which include microorganisms. Bacteria isolated from permafrost for a long time preserve their vitality in extreme ambient conditions in a state of suspended animation or hypometabolism. It is known that soil microorganisms capable of synthesizing a very large number of various biologically active substances including antibiotics, cytokinins, gibberellins, hormone-like substances. It is expected that the bacteria from the permafrost can produce specific biologically active substances that can affect the physiological and biochemical parameters of animals.

The results of research. We used strains of bacteria of the genus Bacillus, selected by us from permafrost of Western and Eastern Siberia and identified by sequencing for 16S RNA. The strains were deposited at the RCM FGUPGosNIIgenetika.

We carried out experiments on the effect of these metabolites: to repair skin wounds of the mice; to repair experimental mechanical erosion of the corneal epithelium of rabbit’s eye and on the outcome of closed brain neurotrauma of experimental rats to study the protective and reparative properties of the metabolites, derived from microorganisms. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19.06.03 “Rules of good laboratory practice in the Russian Federation” of humane treatment of laboratory animals were observed in all experiments.

When studying the skin wound repair rate in mice under the influence of the metabolites derived from bacteria, wound healing of the mice was 18.2% faster than that under the influence of placebo and of 9.1% faster than under the action of the drug “Solkoseryl”.

The study of the efficacy of treatment of experimental erosion cornea of an eye of rabbits with a preparation containing metabolites of the bacteria strain Bacillus sp. showed that a full recovery after experimental injury of the cornea occurs in 2.5 times faster than in the treatment of drug “Solkoseryl”. It was shown that the complex of strain Bacillus sp metabolites in experimental closed brain neurotrauma has a marked protective effect. Mortality of animals in the experimental group was 10 times lower than in the control and reference groups.

The findings suggest that the development of pharmaceuticals based on metabolites of bacteria strains isolated from permafrost may be perspective.
animal products, and use of minerals for treatment of animals diseases. Study of the epizootic situation and the role of geological objects and processes in the animal health allow to develop successful preventive and control measures.

One way of application of geoinformational systems (GIS) is assessment of epizootology of endemic non-contagious animal diseases. This is primarily a management technology that allows to use the resources for control of these diseases.

Epizootological GIS allow collection, storage and analysis of epidemiological information with the ability to display it on maps, and reporting on the set parameters. Using GIS for survey of epizootic processes and the geography of animal diseases improves the methodology of epidemiological analysis of the past and the future.

Special GIS can show the existing relationship between the natural and socio-economic conditions, on the one hand, and animal health, on the other hand. Analysis of information about the incidence of diseases within specialized GIS makes possible to visually establish the relationship between the spread of the disease and geological conditions of the area.

In addition, the GIS contribute to environmental monitoring of pollution caused by pollutants of various origin (toxic substances, radionuclides, heavy metals) and an assessment of the relationship between the spread of the disease and geological conditions of the area.

Analysis of information survey of epizootic processes and the geography of animal diseases improves the methodology with the ability to display it on maps, and reporting on the set parameters. Using GIS for assessment, mainly for metals and metalloids exposure. In fact, Medical Geology is a recognized area of Environmental Chemistry and Toxicology at the Faculty of Chemistry from the University of the Republic (UDELAR).and in the Geosciences Area of the Basic Science Development Programs (PEDECIBA). The chapter leadership integrated geoscientists, chemists, epidemiologists and physicians in the research teams and curricular courses since 2005. The main aspects to take into account for the promotion of Medical Geology in developing countries with Uruguay’s experience, are reviewed in this lecture, in order to help our colleagues to improve the development of this emerging discipline in their own countries.- Continuous education and curricular courses for graduate and undergraduate students have been the main tools to promote and develop Medical Geology in Uruguay since 2003. Using the programs available at the University, we attempted to promote the discipline in seminars, short courses and regional congress sessions inviting MedGeo experts and IDMA leaders from foreign countries. Students can apply for funds for their master or PhD studies in Medical Geology in the governmental basic science development programs (PEDECIBA) and the Research and Innovation Agency (ANII). Regular meetings and conferences have been held with students, expert researchers and delegates from health, environment and geology institutions or private companies, in order to work together on projects of interest to the country, by integrating the available resources of each partner. In conclusion, the main challenge to continue developing Medical Geology skills for approaching environmental impacts and health risks programs, is by working together with experts, students and stakeholders in common projects.

**MG-02 ENVIRONMENTAL GEOCHEMISTRY AND HUMAN HEALTH: GENERAL AND REGIONAL ASPECTS**

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Present report summarizes the theoretical background and concepts of the methodology used to study the impact of environmental and technogenic geochemical heterogeneity of territories on public health. It also illustrates key findings of territorial monitoring at regional, subregional and local levels in Russian Federation and in the Crimean region. This approach allows to integrate environmental and medical data using key indicators for assessment of the impact of geochemical environment on public health status that is not yet realized in monitoring at different levels.

**SECTION: MEDICAL GEOLOGY, PUBLIC HEALTH AND REGULATORY SCIENCES (MG)**

**MG-01 HOW TO PROMOTE MEDICAL GEOLOGY IN DEVELOPING COUNTRIES. CHALLENGES, ACHIEVEMENTS AND SUCCESS IN URUGUAY**

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Medical Geology is a worldwide growing discipline dealing with the Geosciences and Health sciences. In Uruguay it became a very important approach to environmental health risk assessment, mainly for metals and metalloids exposure. In fact, Medical Geology is a recognized area of Environmental Chemistry and Toxicology at the Faculty of Chemistry from the University of the Republic (UDELAR).and in the Geosciences Area of the Basic Science Development Programs (PEDECIBA). The chapter leadership integrated geoscientists, chemists, epidemiologists and physicians in the research teams and curricular courses since 2005. The main aspects to take into account for the promotion of Medical Geology in developing countries with Uruguay’s experience, are reviewed in this lecture, in order to help our colleagues to improve the development of this emerging discipline in their own countries.- Continuous education and curricular courses for graduate and undergraduate students have been the main tools to promote and develop Medical Geology in Uruguay since 2003. Using the programs available at the University, we attempted to promote the discipline in seminars, short courses and regional congress sessions inviting MedGeo experts and IDMA leaders from foreign countries. Students can apply for funds for their master or PhD studies in Medical Geology in the governmental basic science development programs (PEDECIBA) and the Research and Innovation Agency (ANII). Regular meetings and conferences have been held with students, expert researchers and delegates from health, environment and geology institutions or private companies, in order to work together on projects of interest to the country, by integrating the available resources of each partner. In conclusion, the main challenge to continue developing Medical Geology skills for approaching environmental impacts and health risks programs, is by working together with experts, students and stakeholders in common projects.

**MG-03 HYDROCARBON SPHERE AND SOME DISEASES ASSOCIATED WITH IT**

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_Actuality of the problem in the relationship between humans and geological processes. One of the powerful geological processes is the HYDROCARBON degassing of the Earth. The hydrocarbon field is the environment that is intensively mastered by mankind – the search and extraction of oil and gas resources. Hence, it becomes relevant to study both the HC sphere (poorly studied) and its impact on the health of people living and mastering it. Also, in addition, it becomes relevant because the hydrocarbon sphere is manifested in non-traditional places in deposits, in metamorphic rocks, etc. To study involves a huge amount of material, both literary, and the author’s material. The analysis showed that HC sphere presented in a wide variety of phenomena, from the calm, cool, invisible, permanent, constructive to explosive, hot, spectacular, rapid, destructive. Hydrocarbons are manifested in various forms of gas: free, dissolved, adsorbed, occluded, etc. forming hydrocarbon background of crust. This background is manifested from microinclusions and to giant clusters of oil and gas. There are two large oil and gas accumulation zones in the Earth’s Crust, which are the most powerful sources of toxic hydrocarbons (methane, ethane, propane, hydrogen sulhide, saturated and unsaturated hydrocarbons, polyyclic aromatic hydrocarbons, etc.): the environment that affects the biosphere. Being easily mobile HC affect a person where the following diseases are common. In a complex of morbidity the leading place is occupied by diseases of the respiratory system and poisoning. Diseases of the digestive system, infectious diseases, skin and subcutaneous tissue disorders are also common. There are also petroleum pneumonia, amenia. A number of other less common diseases-ophthalmic, etc. have also been noted. The prevailing diseases may vary depending on the composition of the hydrocarbons. The current analysis will allow to develop preventive measures and preventive maintenance for the population living in places of intensive HC degassing of the Earth!_

**MG-04 MEDICAL GEOLOGY INVESTIGATION IN INDONESIA**

_Andiani Andiani, Aminudin Aminudin_

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_Indonesia is lying in the meeting place of three tectonic plates in the world, namely the Indo-Australian plate, the Eurasian and Pacific plates. The intersection of the three tectonic plates contributes to the diversity of rocks and minerals. The existence of various rocks and minerals are proven to have a positive impact on national economic growth and development over the years. However, the presence of certain rocks and minerals are believed to have an impact on public health and the environment. Investigation of medical geology in Indonesia carried out by Geology Agency under The Ministry of Energy and Mineral Resources in cooperation with the Ministry of Health since 2012. The investigational has focused on public health problems caused by both natural geological conditions and human activity. Some cases the investigation of which is the water pollution by heavy metals as a result of gold mining activities in Pasaman District. Other cases is the disruption of community dental health in Situbondo from consuming acidic water that comes from vulcanism activity. Until now there has been a few investigation results due to the difficulty of obtaining data on disorders of the anatomy inside the body as well as verification correlation between the disturbance and the source of the impact. This constraints caused by weak of knowledge, skills and equipment. Therefore Geological Agency determined to carry out cooperation with foreign institutions that have had experience in the field of medical geology. This cooperation is necessary to accelerate obtaining investigation results which can be used as a basis for policy making in the field of public health and mineral extraction._
MG-05  
DEVELOPMENT AND MANAGEMENT OF INTEGRATED MINERAL RESOURCE POLICY FOR ENVIRONMENTAL SUSTAINABILITY: THE MINDANAO EXPERIENCE, THE PHILIPPINES
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This paper would report the environmental challenges faced by stakeholders in the development and management of mineral resources in Mindanao mining region of the Philippines. The paper would proffer solutions via the development and management of integrated mineral resource framework. This is by interfacing the views of government, operating mining companies and the mining host communities. The project methods involved desktop review of existing local, regional, national environmental and mining legislations. This was followed up with visits to mining sites and discussions held with stakeholders in the mineral sector. The findings from a 2-year investigation would reveal lack of Information, Education, and Communication Campaign by stakeholders on environmental, health, political, and social issues in the mining industry. Small scale miners lack the professional muscles for a balance shift of emphasis to sustainable and responsible mining to avoid environmental degradation. Therefore, there is need to balance ecological requirements, sustainability of the environment and development of mineral resources. This paper would provide an environmentally friendly mineral resource development framework.

MG-06  
EXPLORATORY STUDY BETWEEN RENAL AND GENOTOXIC DAMAGE IN COSTA RICAN CHILDREN WITH RESPECT TO GEOGRAPHIC LOCATION IN THE MESOAMERICAN NEPHROPATHY
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Few places in the world have Chronic Kidney Disease of unknown etiology: Central America, Sri Lanka, Egypt and India. In Central America and the southern part of Mexico, this disease receives a differential name called Mesoamerican Nephropathy and it has been considered one of the most important problems of public health in recent years, and more than 16,000 people have died in Central America between 2005 and 2009 according to the World Health Organization. It was investigated the worst scenario of toxicological risk of Mesoamerican Nephropathy in Costa Rica based on environmental factors related to sugarcane cultivation, such as: amount of hectares of sugar cane cultivated, hectares of sugar cane burned, environmental temperature, height of area, arsenic present in the area, social development index, relative humidity with respect to the rate of Mesoamerican Nephropathy per cantons in Costa Rica reported by Social Security Program, which through a Poisson’s Multivariate Regression Model, establishes the relationship between the variables with respect to the rate of renal disease per cantons in Costa Rica; in addition by means of the Simplex Method an equation was established that allowed to determine the influence of each variable, establishing the zones statistically significant for the environmental sampling. Two cantons were determined for the sampling and also one canton as control population. The populations were compared with genotoxic assays and clinical trials such as: Single Cell Gel Electrophoresis and clinical chemistry tests of renal compromise: Cystatin C and Creatinine, with significant differences between populations studied.

MG-07  
OPEN-CUT MINING: ITS DEVASTATING SOCIO-ENVIRONMENTAL EFFECTS ON COMUNITARY HEALTH
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The search for natural resources by multinational corporations has led to a growing intensity in the exploitation of indigenous peoples, whose lands are confiscated using deceptive practices employed in deals made between rich countries on behalf of the corporations' insatiable interests, part of an as-yet unstoppable process of neo-colonialism.

Open-cut mining transforms the geographical space where it is practiced, with its associated roads, bridges and other major works presents as progress, while farmers and their families are viewed as future migrants, disposed of with little regard to their own opinion.

The effects on miners’ health are widely known to be diseases typically caused by high-risk activities, such as bronchopulmonary diseases caused by breathing in mineral dust, diseases of the respiratory tract due to inhalation of gases and mineral and organic chemical vapors, skin diseases caused by allergic reaction to a range of chemical substances, various levels of poisoning and subsequent neurotoxic effects, muscle fatigue and neuropathy, as well as a range of cancers, depending on the kinds of minerals being exploited.

It can be stated that not one mine has met the requirement for providing a closure and environmental remediation plan to be put in place following the end of the mine’s operations, meaning that when accidents occur, any environmental cleaning process is either superficial or non-existent.

There is a list of close to 250 diseases caused by mines, to which the metallurgical processes used, such as sodium cyanide in gold separation, must be added.

In conclusion, the changes brought about by open-cut mining have both a direct and an indirect impact on community health, transforming rural life through territorial appropriation that is presented as progress, while farmers and their families are viewed as future migrants, disposed of their inherited lands which are left to become the accumulated assets of corporations.

MG-08  
EFFECT OF WASTE-DUMP SITES ON THE SUSTAINABILITY OF THE WATER RESOURCE ENVIRONMENT IN GBARAIN-NIGER DELTA CATCHMENT OF NIGERIA
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This paper would report on the effect of solid waste on water resource quality in Gbarain catchment of the Niger Delta Region of Nigeria. Gbarain catchment presently host two waste dump sites located along the flanks of a seasonal flow stream and perennially waterlogged terrain. This anthropogenic activity has significantly affected the quality of water resources in particular groundwater in the catchment. This has made the water resource environment toxic leading to poisoning of aquatic life. This contamination is via geological processes such as seepage and direct infiltration of contaminants from these landfill sites into water courses. Contaminated water resources could lead to serious environmental and human health challenges such as loss of human organs to low agricultural yields. Based on field and experimental investigations, modeling, and graphical interpretation, the results indicate heavy metal and fecal pollution in some of the ground water with escherichia coli and total coliforms exceeding the international and regional recommended limits of 0 per 100ml of sample. Land use planning, enactment and implementation of environmental laws are necessary in this region, for effective surface water and ground water resource management.

MG-09  
WE USE PHOSPHORUS AND OTHER FERTILIZERS. IS IT DANGEROUS?
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Many scientists believe that the planet Earth has entered into a new geological era. Conclusive evidences of significant human impact on the atmosphere, oceans, and wildlife have been published. In particular, the biogeochemical cycles of phosphorus and nitrogen were violated. As the result, the content of P and N in soil and water has increased and rate of freshwater body eutrophication has increased.

P content in the biosphere and its biogeochemical cycle have been declared as one of the planetary boundaries [1]. It means that an uncontrolled release of human-made P compounds into the environment may result in disastrous consequences for mankind. For example, there is evidence for direct positive effects of N and P on bacterial growth and, accordingly, total bacterial biomass is very strongly correlated with concentrations of total phosphorus in freshwater and marine ecosystems. Enhanced nutrient loading alone might also influence the abundance, composition, virulence and survival of pathogens that are already resident in aquatic ecosystems. For example, increased N and P availability enhances the replication rate of aquatic viruses. Biological waste disposal activities such as manure applications to cropland can simultaneously increase the loading of P, N and potentially hazardous coliform bacteria to surface waters [2]. To assess the impact of chemicals on the environment a model has been elaborated. The matrix algebra based approach is used as a tool for modelling and an estimation of chemicals in different environmental media (water, air, soil, biota, etc). For the evaluation of the phosphorus system we used a linear donor-controlled mass balance model.
The results of model application for the estimation of the P content in fresh waters of the Russian Federation regions are presented in Fig. 1. The concentrations were calculated using data on the mean water volumes in the regions.

The calculated results show that P loading is most characteristic of regions located in the European part of the country, which matches the ecological situation related to the eutrophication of water bodies in this territory, as well as some regions of the Siberian and Far Eastern Federal Districts.

This research was supported by the Russian Science Foundation, grant 15-17-30016.

REFERENCES:

MG-10
MODELING OF REGULARITIES OF GEO_DYNAMIC AND GEOSOCIAL PROCESSES

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The study of temporal regularities of seismic and volcanic processes within the Pacific Ocean margin, the Alpine-Himalayan belt and the Mid-Atlantic Ridge showed the existence of two period ranges: “short”, 60±10 and 120±20 years, and “long” with common period T"=250±25 and multiple periods T2=450±50, T4=1000±100 and T8=2000±200 years. The analysis led to the conclusion that seismic and volcanic processes occurring within the three most powerful tectonic belts are manifestations of a single wave geodynamic process. The magnitude of geodynamic event was determined in the usual way – proportional to the logarithm of the dropped elastic energy for earthquakes and proportional to volume of ejected material for volcanic eruptions.

A unified database of the strongest natural disasters and social events that have occurred over the past several thousand years was created. The magnitude of catastrophic events in both cases was determined using logarithmic scale based on socially significant parameters – material damage and human casualties. Research of temporal patterns of events in this database was conducted using spectral and spectral correlation analysis of time series. The study showed that for both processes the periods:

\[ T_0 \approx 450 \pm 50, 4 \quad T_0 \approx 1000 \pm 100 \quad \text{and} \quad T_0 \approx 2000 \pm 200 \text{years}. \]

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This research was supported by the Russian Science Foundation, grant 15-17-30016.

REFERENCES:

MG-11
THE CURRENT STATE OF MEDICAL GEOLOGY INVESTIGATIONS IN AZERBAIJAN

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Medical Geology is an ancient and re-emerging field of science that combines elements of earth science and public health. But in Azerbaijan Medical Geology as a science began to evolve relatively recently. Medical geology problems take on special significance due to the rapid growth of industry and human technogenic activity. Being a socially oriented discipline and taking into account the specific geological conditions of Azerbaijan in recent years medical geology take on the strategic importance also for our country.

The main tasks of medical geology in Azerbaijan are zonating of the territory from the position of environmental problems and studying of radiation, geochemical and ecological features of these territories. The results of these studies will help to identify and implement a set of measures for diagnosis, treatment and prevention of diseases.

One of the main problems of Medical geology in Azerbaijan is the radon safety of population. According to the International Committee on Radiation Protection 50-75% from common dose of people’s exposure by natural radioactive sources comes from radon. In many countries radon is the second leading cause of lung cancer after smoking. Among the non-smokers it is a major cause of lung cancer.

Indoor radon studies in Azerbaijan were carried out for the first time in 2010-2011. In 2014-2015 the investigation of radon problem in Azerbaijan has been continued in the framework of Azerbaijan State Program (2014-2018). Measurement of radon levels in dwellings, soil, thermal waters and mud volcanoes, medical examination of population, development of actions for reducing radon risk, creation of regulatory acts, public education, etc. are the main objectives of this program.

Measured indoor radon concentrations varied in a wide range: from 20 to 1109 Bq/m³. About 7% from total amount of measurements exceeds maximum permissible limit in Azerbaijan (200 Bq/m³). Based on obtained data the map of distribution of indoor radon volume activity in Azerbaijan for the first time was created. The elevated radon concentrations are mainly observed in mining and folded areas of the Greater and Lesser Caucasus and Talysyz region. Results of measurements of radon concentrations in indoor air are in good agreement with data of radon content in the soil air. The content of radon in thermal waters generally isn’t high, except the waters of carbon source in Talysyz region, where its concentration is above the maximum permissible level accepted for drinking waters. Increased values of radon volume activity in the mud volcanoes (especially in the gases released from the griffins) have been also revealed.

During data comparison a definite correlation between high levels of radon concentration and lung cancer risk has been revealed.

MG-12
GEO-SPATIAL IMPACT ON PUBLIC HEALTH IN THE COASTAL REGION OF WEST BENGAL, EASTERN INDIA: AN APPRAISAL ON MEDICAL GEOLOGY

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The present study reveals strong influence of surface geologic materials, altitude and slope of the surface; pH, conductivity, salinity groundwater and subsurface groundwater movement on the geo-spatial distribution of chronic disease hotspots, whose varied spatial distribution imparts significant impact on public health. The coastal tract of Purba Medinipur District of West Bengal in Eastern India is characterized by the linear palaeo-sandbar/sand dunes with intervening low lying (tough) areas of clay and silt. These bars are found to act as barriers to the return of the sea water in low tide, which enters inland during high tide; effectively increasing the residence time of saline water in the coastal fringes. The spatial distribution of chronic diseases, i.e. Acute Diarrhoeal Diorder (ADD) and Acute Respiratory Infection (ARI) besides fever, reveals distinctive zones as disease hotspots. Interestingly, the areas showing higher incidences of ADD coincide with the areas of low ARI occurrences and vice-versa, clearly indicating anisotropic geo-spatial distribution of chronic diseases in the region. Moreover, a strong groundwater divider separates the affected regions of these two major diseases. Low surface altitude and slope, presence of clay:high pH, moderate conductivity, low TDS and moderately high salinity of groundwater demarcates the regions affected with ADD. ARI dominated areas are characterized by high surface relief and slope, abundance of sand; low pH, low conductivity, moderately low TDS and moderately low salinity of groundwater.

MG-13
GLOBAL CLIMATE CHANGE, GROUND-LEVEL OZONE AND HUMAN HEALTH

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Ozone (O3) is a well-documented respiratory oxidant. There is increasing epidemiological evidence points to extra pulmonary effects of ozone, including correlation
between ambient O3 concentrations and cardiovascular, respiratory morbidity and mortality. Increase in ozone concentration in troposphere caused by air pollution and heat waves could have an impact on population health by negative structural, functional and biochemical changes in living organisms and lead to the increase in morbidity and mortality.

In the present study, methods of the statistical correlation analysis were used to reveal a relationship between some diseases and ozone concentration in troposphere. Temporal series analysis of ambulance calls related to cardio-vascular diseases and average daily air temperatures and concentrations of tropospheric ozone were compared for summer months in 2008, 2009, 2010 years in Vyatskie Polyany, Kirov Region, Russia. Temporal series analysis of ambulance calls related to respiratory system diseases and average daily air temperatures and concentrations of tropospheric ozone were compared for June–August in 2010 in Moscow City. Strong correlation between ozone concentration and the rate of ambulance calls related to cardio-vascular diseases was observed for average daily ozone concentrations above 60 μg/m³, lasting from 13 to 16 days. The correlation coefficient was 0.62. The high levels of ozone tropospheric concentration observed in Moscow City did have a strong correlation with the rate of ambulance calls related to the diseases of respiratory system. Correlation coefficients for the hourly average maximum concentration of ozone at the ground level with community-acquired pneumonia were 0.787, and 0.808 for mortality.

We found that ozone modified temperature effects cardiovascular diseases of the population in Vyatskie Polyany during the summer of 2010. In Moscow, the acute effect of high ozone levels on mortality and respiratory diseases did show variability with the population age and was very unfavorable to the elderly group of people.

MG-14

MEDICAL GEOLOGY AND VOLCANOES

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Volcanic activity poses a hazard to human health and life in both, short and long time scales. Volcanic products such as pyroclastic flows or lahars have produced numerous fatalities worldwide in minutes or hours. Long time exposure to other volcanic products may harm the health of people and many animal and vegetal species. Gases may affect health by their toxicity (SO2, HCl, HS, HF) or by displacement of oxygen from air (CO2). Exposure to volcanic ash may cause or worsen respiratory diseases by inhalation and also produce eye and skin damage. Furthermore, toxic elements adsorbed on ash like fluoride, arsenic and heavy metals may contaminate water bodies and vegetation constituting an indirect health hazard to humans and animals. About ten thousands of farm animals were affected in the 1985 eruption of Longinay volcano in Chile, and about 6000 lambs died in Iceland from Hekla eruption. At Popocatépetl, México, fluoride in aqueous leachates has been found in ash settling locations in some of the recent eruptive events. Monitoring of leachate composition should thus be compulsory to protect population, particularly in a volcano that erupts frequently. Chemical analysis of leachates must rely on accessible and quick methods to provide fast results to the communities at risk and allow them to react applying adequate health protection measures. In México analysis is carried out with potentiometric and spectrophotometric methods, using equipment usually present in laboratories for water quality analysis. This facilitates chemical monitoring of leachates, making this a practical health protection practice.

POSTER SESSION

SESSION: ENVIRONMENTAL GEOCHEMISTRY AND HUMAN HEALTH (EG)

EG-01

PRODUCTS BASED ON ZEOLITE FOR ORAL USE IN A FREE MARKET IN SERBIA

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Due to their ability as absorbents, zeolites have been in focus of various researchers for several decades. More than fifty natural and a number of synthetic zeolites are currently. According to chemical composition, zeolites are aluminosilicates of calcium, sodium, potassium, strontium, barium and other cations with different amounts of water molecules. For most zeolites, distribution of Al3+ and Si4+ in tetrahedral positions is arranged. The tetrahedrons of silicon and aluminum form the rings, between which there are cavities with large cations (eg. Ca2+, Na+) surrounded by the dipolar molecules of water (forming hydration complexes with large radius). The size of the cavities and the channels in the skeleton of Si – Al depends on the ratio Al/Si. Zeolites with more Si atoms have higher cavities and therefore contain more water. When zeolite loses water by heating, their structure is not disturbed. The temperature of dehydration of the zeolite depends on its structure and composition. On the basis of different thermal studies of natural zeolites (eg. clinoptilolite-beudantite type of zeolite – Allee et al. 1975; Knolhln et al., 1981), beside externally absorbed water, slightly bounded zeolitic water and tightly bounded zeolitic water also exist. Dehydration of slightly and tightly bound zeolitic water generally takes place at temperatures > 75 °C to a maximum of 400 °C. Dehydrated zeolites are able to absorb water, and other molecules (H2S, petroleum products...). For these reasons zeolites are widely used in petrochemical industry, as thermostable molecular sieves, for softening and purifying water, for maintaining moisture in the soil. Furthermore, zeolites are also used for the purposes of animal nutrition, as well as for human consumption, as a dietary supplement.

In recent decades, there have been a lot of products declared as zeolites for oral use in free market in Serbia. They can be found not only in pharmacies but also in health food stores. Most of these products have incomplete or non-existent declaration. The results of investigation of several commercial zeolite products purchased in pharmacies in Belgrade are presented in this paper. The samples were investigated by X-ray powder diffraction (XRD) and scanning electron microscopy coupled with energy-dispersive spectrometry (SEM – EDS).

According to X-ray diffraction, clinoptilolite-beudantite type of zeolite was identified in all samples as dominant phase. A small amount of mixe, quartz, calcite and some clay minerals are occurring in all the samples.

Beside of these phases, a minor presence of Ti-magnetite was found by SEM-EDS analysis. The morphology of zeolites is usually occurring in the form of tabular crystals (monoclinic symmetry). The particle size of all samples was very variable, in interval of less than 0.1 mm to about 60 μm. Particles between 0.2 and 0.5 μm in size were found to be dominant.

EG-02

PRELIMINARY STUDIES OF ANNUAL EFFECTIVE DOSE EQUIVALENT (AED) DUE TO TERRESTRIAL RADIONUCLIDES RECEIVED BY BARRA DE VALIZAS INHABITANTS AND TOURIST

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The Uruguayan east coast has several mineral resources, which include black sand ores in the Aguas Dulces-Valizas area. The activity concentration of 226Ra, 232Th and 238U and 232Th and 238U and 238U and 232Th in sand and soil in Barra de Valizas was determined in order to evaluate the outdoor annual effective dose equivalent (AED) received for the inhabitants and tourists. For the quantification of these radionuclides in sand and soil, samples were collected at a depth of 5 cm from the top surface layer to produce approximately 2 kg wet weight sample. Each sample was dried at a temperature of 60°C until a constant weight was reached, the samples were filled into 500 mL Marinelli flasks. After approximately four weeks in order to reach secular equilibrium of the 228Ra and 232Th series, samples were measured by gamma-spectrometry with a High Pure Germanium Detector GMX35P4-76-RB, 35 % efficiency and 1,75 % resolution for photopeak of the 228Th. IAEA reference materials were used for efficiency calibration.

226Ra was studied by the the photopeack of 208Tl (609.3 keV). The Th was evaluated by the photopeack of 208Tl (911.1 keV) and, 232Th was evaluated by its own photo peak 1460.0 keV.

The outdoor annual effective dose equivalent (AED) was evaluated for inhabitant and tourist using the conversion coefficients recommended by UNSCEAR. They are in the range 60-100 μSv/y for inhabitants, with some values higher than the world average value of 70 μSv/y, although always below the recommended limit set by UNSCEAR.

EG-03

MEDICAL AND GEOLOGICAL PROBLEMS OF THE NORTHERN BLACK SEA REGION

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Introduction. Geological factors cause different risks: incidence rate, traumatism, destruction of different organisms. It is a natural source of ecological risk [1]. Stage of development of geological factors determine amount of economical resources which could be spend on optimization of territory for human habitation and other economic activity. Unification of analysis of quality of resources potential of Black Sea region for different economic activity models is the main objective of this research.

Results. The unification of interdisciplinary criteria of evaluation of resources potential have been made. Author’s approach to the identification of geological factors of ecological risk by the example of key sites. Potential sources of risks (natural and technogenic) that cause human and animal diseases have been established.

Discussion. Complex research of north part of Black Sea region allow to rank investigated territories by factors of risks. Natural deficit of biopilifous elements (Zn, Cu, I) in food chain have been established. The same way natural imbalance of Ca and Sr; overbalance of toxic elements (Ph, Ni and other elements) [2-4] that cause diseases of native population. Correlation to the program of rehabilitation of territory with taking into account development history of region and culture of native population have been proposed.

Summary. Introduced approach allows to identify sources of risks, which determine direction of correction of program of rehabilitation of native population health on regional level. It also regulates types of economic activity acceptance for optimal sustainable development of region. The study is supported by RFBR, project N 15-37-10100.
ON DISTRIBUTION OF RADIONUCLIDES IN CULTIVATED ELEMENTARY LANDSCAPE GEOCHEMICAL SYSTEMS CONTAMINATED AFTER THE CHERNOBYL ACCIDENT

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One of important scientific and practical problems of modern biogeochemistry is the study of spatial structure of geochemical fields formed by radionuclides. The main goal of our research is a detailed study of spatial distribution of technogenic radioisotope 137Cs of the Chernobyl origin, of spatial structure of geochemical fields formed by radionuclides. The main goal of our research was conjugated ELGS was analyzed using Surfer 11.6 software.

The studies of 2016 were devoted to revealing distribution of radionuclides in soils of agri-cultural landscapes being after the accident but abandoned and overgrown by ruderal vegetation. We tested a hypothesis of similarity in character of lateral distribution of 137Cs in soils of conjugated ELGS of agroecosystems and the one established earlier in natural systems. A sloping area with elevation difference of 11.83 m within 185 m was selected as a study plot. Measurement of radionuclide activity was performed along cross-section from the top point to local depression in increments of 1 m using a field gamma-spectrometer Violinist III (USA), with collimated scintillation detector (NaI[Tl]) 2.5 inches in diameter. Radioactivity measurements were accompanied by theodolite survey at every point. To verify field data and to reveal vertical 137Cs and K40 distribution undisturbed soil cores were taken at the selected 16 points down to a depth of 40 cm. Cores location was based on results of the field gamma-survey. Laboratory gamma-spectrometry was carried out with spectrometer Canberra (USA). Spatial distribution of radionuclides in conjugated ELGS was analyzed using Surfer 11.6 software.

Obtained results showed that lateral distribution of 137Cs in soils of agriculturally transformed ELGS exhibits cyclic character followed from the top to bottom of the transect similar to 137Cs behavior in natural ELGS observed previously in test site «Alyokovskoe». Activity 137Cs varied from 224 to 779 kBq/m² and that of K40 – from 121 to 217 kBq/m². A cyclic pattern in lateral distribution in both the undisturbed natural ELGS and those transformed by cultivation was proved to be a common feature.

An absence of a remarkable radionuclide unilateral accumulation down the slope obviously reflects specific redistribution of chemical elements in ELGS, which is of both ecological and methodical importance. The finding contributes to effective ecological monitoring and forecast of in-field anomalies formed by contaminants, herbicides, pesticides or fertilizers and helps to obtain ecologically clean agricultural production.

SOIL RADIOACTIVITY AND DOSE RATE ASSESSMENT IN MINING CENTERS OF ARMENIA

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This research was designed to study radioactivity of urban soils and provide a lifetime cancer risk assessment in Armenia’s biggest metal mining centers: towns of Kajaran and Kapan. A pilot study of total beta activity distribution in Kajaran soils has pinpointed existence of radiation loading on the environment and human health.

To determine radioactivity of urban soils and provide a dose rate assessment for Kajaran and Kapan, pedogeochronological survey of urban soils samples of 2005 and 2007 were used, respectively: 10 soils samples were selected randomly per a town. Activity concentrations of naturally occurring radionuclides 40K, Ra226 and Th232 were measured by gamma ray spectrometry (HPGe detector, CANBERRA).

Radium equivalent activity of Kajaran soils varies from 88.10 to 221.24, average 143.46 Bq/kg (1.07 mSv/y). Activity 226Ra and 232Th varied from 4.91 to 1.74, average 8.49 Bq/kg, these being comparable with results of similar investigations implemented worldwide. Outdoor annual effective dose equivalent (AED) was calculated based on contents of naturally occurring radionuclides in urban soils consistent with UNSCEAR 2000 methods. AED for Kajaran varies between 8.22E-02 and 1.24E-01, averaging 5.19E-02 mSv/y. AED for Kapan are lower varying from 2.58E-02 to 8.24E-02, on the average 5.06E-02 mSv/y. Maximal AED exceed world average: 7.00E-02 mSv/y, but are limited beyond the level of 1.0 mSv/y recommended by the International Commission on Radiological Protection (ICRP) for the general public. Excess lifetime cancer risk (ELCR) due to gamma emitted radionuclides in soils is assessed according to ICRP methods. The average ELCR for Kajaran is equal to world average 0.29E-04, and is significantly lower for Kapan 0.19E-04.

SHIFTING CYANOBACTERIAL DIVERSITY IN RESPONSE TO AGRICULTURAL SOILS ASSOCIATED WITH DUST EMISSION

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Dust emission to the atmosphere from wind-eroded soils has many environmental impacts, including soil degradation and air pollution. Various agricultural land uses after the topsoil properties and thus affect dust particle characteristics as well as loading of biological components into the air. In the present work, the richness and abundance of bacterial communities in soils of semi-arid loess that are associated with dust emissions were studied by high throughput sequencing methods, and were found to be affected by land uses: conventional agriculture, organic agriculture alternating with grazing, uncontrolled grazing activities and natural non disturbed soil. Moreover bacterial diversity was shown to be influenced by the contents of sand, CaCO3, and particulate matter in the topsoil. Of all bacteria taxa detected, cyanobacteria were found to be most strongly influenced by land use: natural and grazing lands were highly abundant with cyanobacterial reads (about 33%) whereas conventional agriculture lands and organic agriculture lands alternating with grazing contained only 7% cyanobacteria. When examining macro-aggregates in two soils (natural and grazing), approximately 44% of reads were found to be affiliated to cyanobacteria, whereas in micro-aggregates their concentration decreased to about 11%. Intensive agricultural use leads to a reduction in soil aggregation and significantly decreases cyanobacteria abundance, in turn increasing dust emission potential and loss of topsoil materials to the atmosphere.

CANCER AND NON-CANCER RISK DUE TO EXPOSURE TO POTENTIALLY-TOXIC ELEMENTS IN CONTAMINATED GROUNDWATER ADJACENT TO AN INDUSTRIAL CHEMICAL COMPLEX (ESTARREJA, NW PORTUGAL)

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The Estarreja Chemical Complex (ECC) (NW Portugal) has had an intense industrial activity since the early 1950’s, which lead to high levels of groundwater contamination. This industrial activity produced a large volume of toxic-waste solids and liquid effluents, which were disposed for decades in areas that were not prepared for such purpose. ECC is surrounded by an agricultural

Table 1. Arsenic concentrations in water, urine and hair samples from Ouro Preto, Minas Gerais, Brazil

<table>
<thead>
<tr>
<th>Water (μg/L)</th>
<th>Urine (μg/g)</th>
<th>Hair (μg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>2.02</td>
<td>2.01</td>
</tr>
<tr>
<td>Maximum</td>
<td>2.09</td>
<td>2.10</td>
</tr>
<tr>
<td>Mean</td>
<td>2.05</td>
<td>2.06</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

The contamination of watersheds by trace elements is an important environmental issue in the Iron Quadrangle of Brazil. The region has been intensely affected by gold exploitation since the 18th century and the old mines expose sulfide minerals to oxidation, releasing trace elements to surface and groundwater. Some old mines in Ouro Preto, MG, are still used by the population as water supplies. Thus, a geochemical characterization of public water supply, urine and hair was conducted in order to evaluate the extent of water contamination and population exposure to trace elements, focusing on arsenic. 56 urine samples and 44 hair samples were analyzed by ICP-OES and ICP-MS. The results of this investigation, as described in Table 1, have indicated that the water samples are heavily contaminated by As. This is strongly correlated to the geology of the area, characterized by high concentrations of sulphide veins with gold mineralization. However, As concentrations in urine and hair were found to be relatively low. Therefore, the statistic correlation indicates that As has not been bioaccumulated within the sampled group of the population. Nevertheless, animals, plants and soils may be contaminated in the region. Thus, further studies are recommended to better understand the environmental implications of the high concentrations of As in the water of Ouro Preto.
The surroundings of the Estarreja Chemical Complex (NW Portugal) have an intense industrial activity with negative impact on soil, surface water and groundwater since the early 1950’s, and its population heavily relies on groundwater as a source of water supply for human and agricultural uses. This industrial activity produced a large volume of toxic waste solids and liquid effluents, which were disposed in areas that were not prepared for such purpose. During the 1990’s, several rehabilitation actions resulted in an important reduction of the negative environmental legacy. However, we found concentrations (μg/l) of Al, Cu, Fe, Hg, Mn, Pb and Zn in groundwater well above the international and Portuguese recommended values. Less than ~10% of neurologic diseases have a genetic etiology and the majority have an unknown origin. Occupational and environmental exposures to several metals (e.g., Hg, Al, Mn, Cu, Pb, Fe and Zn) appear to be a risk factor for neurodegenerative pathologies, such as Alzheimer’s disease, Parkinson dementia, etc. The neuropsychological assessment of a pre-selected population in the studied area is being performed and correlated with the content of selected metals on human biological samples. The experimental sample of this study to date has proved to consist mainly of normal subjects (40 %), followed by the condition of dementia (37 %), and subjects with normal conditions (23%). The analysis of RS FGT results indicate that 30% of subjects with MCI will be more likely to convert to PD or AD. Maximum fingerprint levels of Mn (1.43 μg/g) were found in a subject with Parkinson dementia, while the maximum toenails Mn level (1.38 μg/g) was found in a subject with MCI. Median fingerprint levels (μg/g) were elevated for Hg, particularly in subjects with dementia (0.8), and also in MCI (0.6).

EG-11

LINKING VOLCANIC SOIL COMPOSITION AND CANCER RISK IN SANTIAGO ISLAND (CAPE VERDE)

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The topsoil of Santiago Island is enriched in Co, Cr, Cu, Ni, Zn, Mn and Cd relative to upper crust values. The hazard and the carcinogenic risks due to exposure to some potentially toxic elements (PTEs) by the Santiago Island (Cape Verde) population were calculated, considering soil ingestion, inhalation and dermal contact as exposure pathways. Hazard indices (HI) were calculated for these metal exposures of the Santiago Island population for children and adults. For children HI are higher than 1 for Co, Cr and Mn. So there is indication of potential non-carcinogenic risk. Cancer risk was calculated for Cd, Cr and Ni and exposures and the results were higher than the carcinogenic target risk of 1x10⁻⁶ for Cr. A realistic assessment of actual health risks associated with PTEs in soils requires evaluation of bioaccessible metal fractions. The estimation of bioaccessibility of PTEs in Santiago soils was done using the UBM method. It is necessary to characterize the health risks of PTEs in soils through multi-pathways (ingestion, inhalation, dermal) incorporating bioaccessibility adjustments. Bioaccessibility provides another boundary value—that is, the most conservative value for human protection—as to what could potentially become available to the human systemic circulation and thus available for uptake.

EG-12

ECOSYSTEMIC APPROACH TO HUMAN HEALTH: A TOOL FOR ENVIRONMENTAL STUDIES

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Introduction Our Century has the task of promoting human Health in healthy communities that are environmentally sustainable as well. The Ecohealth approach is facing the challenge of improving the quality of life of men and women in countries of low income and vulnerable societies through a new way of research, education and practice that aims at the construction of healthier communities and environments. Objective The objective of this presentation is to show briefly the work methodology in Ecohealth. Development In an Ecosystemic approach to Health, humans are placed in the center of the considerations regarding development, at the same time seeking the durability of the ecosystem of which they are an integral part. There can be no sustainable development unless all the interventions take into account the well-being of humans the same as the protection of the ecosystems. Ecohealth makes an holistic approach to the health problems of the population, because they go beyond the sole competence of the Health sector. These studies include the way societies are structured and the relations between social actors. Environmental and social factors are integrated in order to study the illnesses and to manage solutions in a participatory scheme. Therefore the dynamic interaction between the different components of the ecosystems and the well-being and human health, are emphasized. Furthermore, this approach considers transdisciplinary projects (with gender analysis and participative methodology) to result in better research and improvement of human health and the environment. Accordingly, well-being and human health are part of the impact evaluation. Conclusion Ecohealth proposes a research and action approach aimed at sustainability and social and gender equity, through the decision making at various levels by politicians and social actors. With the participants of this Symposium we will share a deeper insight into the pillars of this new methodology, mainly transdiscipline, gender, research methods with concept maps, and a practical case study of Mercury in Latin America.
EG-13

LEACHING OF THALLIUM FROM EXTREMELY CONTAMINATED SOILS COLLECTED FROM GUIZHOU, CHINA

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As a highly toxic heavy metal, thallium (Tl) in the soil endangers human health severely via being absorbed by plants or infiltrated to groundwater. Soil leaching is an effective method to remove heavy metals from soil. A batch experiment was conducted to remediate two Tl-contaminated soils close to Tl mining area (Guizhou, South of China) by using oxalic acid (OA), citric acid (CA), ethylene diamine tetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), HCl, HNO\(_3\), and Ficoll. The SEM and XRD were used to analyze the morphology changes and crystal phases of the soil before and after leaching. The results showed that oxalic acid was the best acid leaching agent with the leaching efficiency of Tl from the two soils were 75% and 95%, respectively. The optimal soil washing option for Tl was achieved at the OA:eluent concentration 1 mol/L, pH 0.5 and washing time 16 h. The results showed that the main states Tl leaching was. The mechanism of Tl leaching was found to involve the initial metals salts dissolution, that was pH-dependent, followed by the development of exchange reactions between the metal-OA complexes previously formed.

EG-14

IN SITU BIOSYNTHESIS OF BACTERIAL CELLULOSE HYBRIDS

COMPOSITES FOR BIO-APPLICATIONS: GREEN ONE-STEP PROCESS

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Green chemistry based in only one-step arises from the need to obtain biocompatible, biodegradable and ecologically sustainable biocomposites, using new strategies which reduce more and the use of solvents. In situ biosynthesis of new biocomposites with bioactive compounds have offered a great interest to obtain environmentally friendly and biofunctional materials for applications in different fields such as medicine. In this work, a simple and green route to the synthesis of new hybrid biocomposites of bacterial nanocellulose–Porto Santo’s biogenic clays (BNC/BioC) using one-step in situ biosynthesis was studied. The BioC incorporation into BNC network was made during their biosynthesis by Gluconacetobacter sp. The new hybrid nanocomposites samples was investigated through specific techniques of characterization such as Attenuated total reflection Fourier transform infrared spectroscopy, field emission scanning electron microscopy, X-ray diffraction, interference gas chromatography, energy-dispersive X-ray spectroscopy and thermogravimetric analysis. The BNC/BioC biohybridized revealed a decrease in water absorption uptake and crystallinity due to the BioC incorporation. Besides that, it occurred changes in surface properties of the new biocomposite namely in the non-polar active sites and in the basic character due to the rearrangement of the chains of cellulose and the BioC incorporation during biosynthesis. BNC/BioC hybrid biocomposites reveals potential to be applied in biomedicine field due to the exhibited properties.

EG-15

IDENTIFICATION OF THE IMPACT OF IRRIGATION USING ALKALINE NA-AS RICH GROUNDWATER ON SOILS IN THE SOUTHERN CORNER OF THE DUERO BASIN (SPAIN), USING GEOSTATISTICAL METHODS

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Problems of high-As groundwater are known in the southwestern corner of the Duero Basin. In this area the occurrence and distribution of As in groundwater is controlled by inputs of cold-hydrothermal waters flowing through the faults of the fissured basement of the basin. The deep aquifer levels of the Tertiary aquifer, which are closely associated with this fractured basement and characterized by a Na-HCO\(_3\) hydrochemical facies, high pH and high As content, have been used in some sectors for irrigation. As a consequence, there have been significant drops in the piezometric levels in these sectors alongside probable soil salinization. The distribution of pH, As and Na in soils was estimated using geostatistical methods, particularly Ordinary Kriging (OK). Three scales of spatial variation were identified by means of experimental variogram. The spherical model was fitted in every case. The geochemical database studied was from the Instituto Geológico y Minero de España (IGME). The study reports relative increases in pH, As and Na in soils from sectors irrigated with deep groundwaters. This enrichment in soils may result eventually in a deterioration in soil quality and crop yields, in an area where there are already problems of waterlogging from As that compromises the use of groundwater for drinking purposes. Groundwater management options should focus on preventing and minimizing the use of these waters, because they are a continuous source of Na-As input to soils. Acknowledgments. This work was supported by the Instituto Geológico y Minero de España, IGME (projects HidroGeoTox and SoilWater).

EG-16

CHEMICAL PROPERTIES OF ILICA (KAHRAMANMARAŞ) THERMAL WATERS AND THEIR BENEFICIAL EFFECTS ON HUMAN HEALTH

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Ilıca hot spring is 70 km awe from Karsmanmaras city centre. Thermal waters used for health start with primitive structure sand continues to day with modern hotels, rehabilitation centers and physical therapy centers. Patients who are sent to spa facilities for treatment by doctors are paid by the institution for their treatment costs.

Ilıca thermal waters in the study are a north of the town are exposed along the east-west trending faults. The temperatures of the source and the drilling waters are 43-45°C, debite, 4.5 sl./s, Pb 7-8.5, total mineralization is 250-450 mg/l. pH is 7-9 and it is basic water. In the hot waters of Ilıca, Ca and HCO\(_3\) ions predominate and are in the Ca HCO\(_3\), facies. According to the Piper diagram, it is included in group 5 and it is non-carbonate hardness. This thermal waters is in the immature class of water that has not reached the equilibrium according to the Gigenbach diagram. Waters according to AHI classification Ca, Mg, HCO\(_3\), S, is a mineral water poor acroterm waters. Balneology uses water at 38-42°C temperature for this reason thermal waters can be used for therapeutic purposes. Thermal water contain high level of dissolved carbonate and S value so these water used in the treatment purposes.

Ilıca water is hydromineral water with high concentration of Ca(2+), Mg(2+), Na(+) and K(+) ions. Due to the high concentration of sodium ions the water is not suitable for drinking purposes. However, Ilıca thermal water is suitable for medical purposes. Ilıca water has high mineralization with 390 mg/l in Al(3+) and 310 mg/l in Na(+) ions. Although the high mineralization, the Ilıca thermal water is suitable for medical purposes. This water used in the treatment of skin diseases.

EG-17

IN SITU BIOREMEDIATION OF ACID MINE DRAINAGE: A LOW-COST APPROACH TO PROTECT DRINKING WATER SOURCE

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Flowers and green plants are used to remediate AMD in several cases in China. The objectives of this study were to establish efficient and economical biotechnological processes for AMD management. The biotechnology was applied in Ca, Mg, Na, K, and Pb concentrations in AMD. A microbial community was isolated from AMD. The bacteria had a low-cost process to obtain biogeochemical properties of AMD. The biotechnology was applied to remediate AMD from different sources. The results showed that the biotechnology was effective in treating AMD from different sources.

EG-18

PROBLEMS CAUSED BY THERMAL SAMSUN (TURKEY) THERMAL WATERS IN GEOTHERMAL SYSTEMS


Acid mine drainage (AMD) from abandoned coal mining sites generally has low pH values and high concentrations of metals (e.g. Fe, Mn), which pose serious risk to the downstream drinking water sources. The Aha reservoir has long been impacted by the coal AMD from Yuyou River, which is an important source of the drinking water in Guany, southwest China. This resulted in high contents of iron, manganese, sulfate and other heavy metal elements in the reservoir water and sediment, which has seriously affected the local water supply quality. However, the conventional treatment methods for AMD, such as lime neutralization, have limitations of secondary pollution risk, high cost, and free of sustainability. This paper introduced a new method depends on in situ bioremediation to treat AMD. This is a simple, cost-effective and more sustainable approach. A pilot system was constructed upstream Aha reservoir in 2012. The system consists of two oxidation-pretreatment ponds and three microbial treatment ponds. Through long term running, the system could reduce the concentrations from 920 (inflow) to 71.6 mg/l (outflow) for Fe, from 46 to 12 mg/l for Mn, from 4905 to 343 mg/l for SO\(_4\)\(^2-\), with the removal rates are 92% for Fe, 73% for Mn, and 29.9% for SO\(_4\)\(^2-\). Overall, the approach of in situ bioremediation treats the risk of AMD in low cost and sustainable way, so as to achieve the purpose of protecting drinking water source.

EG-19

CHEMICAL COMPOSITION AND AGRICULTURAL AND PASTURE SOILS FROM AN INDUSTRIAL SITE IN NORTH CENTRAL PORTUGAL

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The environmental impact of several chemical industries implemented at the Estarreja Chemical Complex (ECC) is felt at Estarreja municipality since the 1950s. The ECC is composed of several chemical industries which are recognized as important sources of contaminant inputs into the environment, the most important being related to past industrial activities, namely the production of sulphuric acid from anurcprate roasting and the activity of a chloralkali plant.
The main purpose of this study was to evaluate the sources, as well as the dispersion mechanisms of a large set of parameters (42 organic compounds and 46 chemical elements) in soils with high agricultural activity, located nearby sewage outlets. Local background was calculated from a reference site, 40 km south of Estarreja with no significant industry but a similar population lifestyle, geology and pedology. For this purpose 22 soil samples were analyzed for inorganic parameters by ICPE-MS and for organic compounds by CGMS.

Organic compound concentrations in Estarreja soils are not very high when compared to the concentrations in European soils, except for PAHs in a few samples. For inorganic contamination As in 75% of the soils exceed the Health Canadian Soil Guidelines for agricultural purposes. In the reference area these contaminants were not detected. The results indicate that in the most critical locations the research should be extended to water irrigation and edible vegetation because contamination in soils used for pasture and/or agricultural activities may represent a potential health hazard.

EG-19

DETERMINATION OF TL(I) AND TL(III) BASED ON MICROCOLUMN SEPARATION BY ICP-MS AND APPLICATION TO TL SPECIATION ANALYSIS AT THE INTERFACE OF SOIL AND GREEN CABBAGE

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Thallium is a typical toxic element. The geochemical behavior and biological effect of Tl is closely related to its occurrence chemical form in the environment. However, little is known regarding the chemical speciation of Tl in the soil and plant. This current study is based on microcolumns of immobilized oxine selective adsorption of Tl(I) when the DTPA exist and DTPA assisted with ultrasonic mobilization and DTPA selective adsorption of Tl(I) from soil extracts. The Tl speciation analyses results indicated that Tl in the soil and plant is occur in the the aboveground organs. The fraction of Tl in the soil has the most environmental significance of soils also mainly exists on the speciation of Tl(I). The improved analytical method presented in this study offers an economical, simple, fast, and wide application to the chemical speciation of Tl in the soil and plant. This current study is based on microcolumn of immobilized oxine selective adsorption of Tl(I) when the DTPA exist and DTPA assisted with ultrasonic mobilization and DTPA selective adsorption of Tl(I) from soil extracts. The Tl speciation analyses results indicated that Tl in the soil and plant is occur in the the aboveground organs. The fraction of Tl in the soil has the most environmental significance of soils also mainly exists on the speciation of Tl(I). The improved analytical method presented in this study offers an economical, simple, fast, and wide application to the chemical speciation of Tl in the soil and plant.

EG-20

EFFECTS OF VARIOUS AMENDMENTS ON MULBERRY UPTAKE CD FROM POLLUTED SOIL

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Compared with other hyperaccumulators, the economic crops have become hot research objects in the phytoremediation field because of their large biomass, strong environmental adaptability and available considerable benefits, especially mulberry. At the same time, amendments have been widely applied to assist phytoextraction. In this project, an experiment was conducted in laboratory to study the effects of various amendments on mulberry uptake Cd from polluted soil. Compared to other amendments, the citric acid treated had the highest Cd concentration in roots of mulberry with the maximum increased 25.8%, relative to the non-treated control. The DTPA and oxalic acid treated had the similar Cd concentration in mulberry, relative to the non-treated control. The results also show that the distribution of Cd in the mulberry tissues followed a descending order, i.e. roots > stems > leaves. The Cd mainly stored in the roots of mulberry, with all bioconcentration factor (BF) values of roots exceeding 1.0, up to a maximum of 5.8. This study provides a select amendment to enhance the Cd contaminated soil remediation effects using mulberry.

EG-21

BIOSORPTION AND BIOACUMULATION OF THALLIUM BY THALLIUM-TOLERANT FUNGAL ISOLATES

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Thallium (Tl) contamination in soil exerts a significant threat to the ecosystem health due to its high toxicity. However, little is known about the effect of Tl on the microbial community in soil. The present study aimed at characterizing the culturable microbial groups in long-term Tl-polluted soils. The soils at the study site were highly contaminated with Tl derived from Tl-rich sulfide mineralization and mining activity in Guizhou Province, Southwest China. Our investigation clearly showed the existence of cultivable bacteria, filamentous fungi and actinomycetes in long-term Tl-contaminated soils. Indeed, some fungal groups can grow in the presence of high Tl level up to 1,000 mg kg-1. We have isolated and identified nine Tl-tolerant fungal strains based on the morphological traits and ITS analysis. The dominant genera identified were the Trichoderma, Penicillium and Paecilomyces. Preliminary data showed a positive correlation between the biomass and the biosorbed Tl content. The Tl-tolerant strains were capable of bioaccumulating Tl, up to 7,189 mg kg-1 dry weight. The subcellular distribution of Tl showed obvious compartmentalization: cytoplasm >> cell wall > organelle. The majority of Tl (up to 79%) was found in the cytoplasm, suggesting that intracellular compartmentalization appeared to be responsible for detoxification. These findings further support the applicability of the fungal isolates for cleanup of Tl in Tl-polluted water and soil.

EG-22

OCCURRENCE OF URANIUM IN CHINESE-HIGH URANIUM COALS AND THE RELEASE BEHAVIOURS DURING COMBUSTION

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Uranium is a naturally occurring radioactive element in coal. The uranium content and speciation in several Chinese high-uranium coals was studied. The release and speciation transformation of uranium during coal combustion was investigated by experimental and thermodynamic equilibrium modelling. The uranium in coal mainly associated with organic matter, and the rest are occurred in the Fe-Mn oxide fraction, carbonate fraction and residual fraction. The uranium release ratio did not increase consistently with the combustion temperature increasing. The highest release ratio of uranium occurred at 500 °C. The uranium associated with organic matter is probably decomposed and released at the temperature below 500 °C. At the temperature range of 500-900 °C, uranium in organic modes is rapidly transformed into uranium oxides, resulting in the inhibition of uranium release. With the increase of temperature to 800 °C, part of the uranium oxide can react with alkaline and alkaline-earth compounds in coal, particularly calcium, forming various kinds of uranate, which will lead to the further decrease of uranium release ratio. Some of the uranates are thermal unstable and decomposed at the temperature above 1000 °C, while part of them are still immobilized in the combustion products even when the mixture was heated at 1200 °C. This study will provide valuable information for understanding the primary factors and processes that affect the release of uranium during coal combustion.

EG-23

SERUM CU/ZN RATIO IS ASSOCIATED WITH BLOOD GLUCOSE LEVEL, RENAL FUNCTION, AND BONE MINERAL DENSITY IN PEOPLE LIVING NEAR A COPPER SMELTER IN KOREA

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Introduction. Copper (Cu) and zinc (Zn) are essential metals for humans, and their serum concentrations are strictly regulated by compensatory mechanisms. However, an elevated serum Cu/Zn ratio is associated with the pathogenesis of some chronic diseases including diabetes mellitus, Alzheimer’s disease, and cardiovascular disease via oxidative stress generation. This study was performed to investigate the relationships between the serum Cu/Zn ratio and blood glucose levels, renal function, and bone mineral density (BMD) in residents living near an abandoned copper refinery in Korea, a smelter that operated from 1936 to 1989.

Methods. The study included 410 residents aged ≥30 years living within 4 km of the smelter (356 men and 254 women). We simultaneously measured serum Cu and Zn levels and urinary creatinine levels. The Cu/Zn ratio is associated with the pathogenesis of some chronic diseases including diabetes mellitus, Alzheimer’s disease, and cardiovascular disease via oxidative stress generation. This study was performed to investigate the relationships between the serum Cu/Zn ratio and blood glucose levels, renal function, and bone mineral density (BMD) in residents living near an abandoned copper refinery in Korea, a smelter that operated from 1936 to 1989. The BMD T-scores and Z-scores. In the present study, there were no significant differences in the centile, 1.02–1.39), and high (>75th percentile, 1.39) groups according to the Cu/Zn ratio. The results of this study demonstrate that the serum Cu/Zn ratio is significantly associated with some markers of renal damage, blood glucose level, and impaired BMD in individuals with high copper exposure levels. Therefore, an imbalance between Cu and Zn levels may induce oxidative stress and lead to the progression of diabetes and diabetic complications. In addition, the serum Cu/Zn ratio could be a better indicator for diabetes status in humans, and zinc supplementation could be a good preventive or therapeutic method for diabetes mellitus.
GE-24
ENVIRONMENTAL GEOCHEMISTRY OF ESTUARINE SEDIMENTS IN THE SUAPE PORT COMPLEX, PERNAMBUCO, BRAZIL.
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The Massangana and Tatuoca rivers estuarine system of Suape is located in the Suape Industrial Port Complex, the largest area of economic development of the state of Pernambuco. In this area two sedimentary core samples, each with three replicates, were collected. The core samples were sectioned every five centimeters, and then the subsamples were oven dried at 30°C, and subsequently disaggregated and macerated to reach a homogenous silt particle size. Afterwards geochemical analyzes were performed on Atomic Emission Spectrometer to determine the concentration of 46 chemical elements. Fourteen of these elements (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Sr and Zn), due to their environmental relevance, were selected to conduct the geochemical and statistical analysis. The parameters obtained from the core samples were subjected to statistical analysis (Correlation Matrix, Principal Component Analysis). Individual element evolutionary graphics were also produced. The following chemical elements are worth mentioning: Ag, As, Cu, Hg, Ni and Sb. The first four elements showed concentrations between the thresholds of toxicity effect range low-ERL and effect range medium-ERM. The concentrations of these elements in the Suape area are above the reported concentration in other estuarine areas in Pernambuco. Thus, it is necessary to carry out continuous environmental monitoring and supervision of the Tatuoca/ Massangana estuary by the responsible government agency.

GE-25
GEOGENIC CADMIUM POLLUTION AND POTENTIAL HEALTH RISKS IN CHINA
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Cadmium (Cd) is a toxic trace element to many organisms and humans, also a carcinogen and global food contaminant. Previous studies of Cd pollution have primarily focused on anthropogenic sources, little is known on geogenic sources of Cd. However, in our study area Chengkou County, in southwest China, high Cd concentrations in environmental samples are not related to anthropogenic contamination but have natural origins related to black shale bedrock that crops out in the region. The Cd concentrations in black shales ranged from 0.32 to 93.77 mg/kg (mean at 15.03 mg/kg), it was generally held in metal sulfides. The weathering of black shale could result in Cd enrichment and acidification of soil. Soils originating from the Cd-rich black shale generally accumulated Cd, ranging from 0.83 to 21.6 mg/kg (mean at 4.47 mg/kg). The soil pH ranged from 4.23 to 7.84, 76% of samples had pH<7 and 41% of them were lower than pH6, indicating the acidification. Low pH may elevate the potential bioavailability of Cd in soils and lead to the enrichment of Cd in local crops. The area available for arable cultivation in southwest China is limited due to mountainous terrain; therefore, inhabitants living in the countryside have to rely on cultivation on Cd-rich soils, which may influence the safety of food stuffs, and potentially threaten the health of local residents. Therefore, more attention should be paid to geochemical Cd pollution, suitable strategies for remediation and management need further research.

GE-26
ORGANIC MATTER IN SOILS EXPOSED TO REGULAR POLLUTION BY OVERLAND RUNOFF FROM OIL-PRODUCTION SITES
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Human activity has a much more profound and extensive influence on soil formation than originally perceived. Soil as a natural functional system is formed and self-organized only in the space-time continuum of the repeating number of successive influences. The overall focus of this study was to quantify the accumulation of "lipids" in soils exposed to regular pollution by a land runoff from operational cluster oil-wells sites and its influence on the absorption properties of soil phases. It was determined that the carbon content of the lipids can increase to 1/3 of the total carbon content. It results, in turn, in change of absorption properties of soil solid phases. There is a significant negative correlation between the total, inner and outer specific surface areas of the soil samples and the lipid contents in them. The electron microscopy study of various types of oil-containing samples (oil polluted by stock-tank oil, low-density fraction (1<1.4 g/ml) of the oily sludge after all stages of the technological scheme of pyroremediation, and chemozoom exposed to regular pollution by overland runoff from the sites of operational oil wells) has been performed. The transmission electron microscopy has shown the presence of electron-opaque spatially structured organic formations with different morphologies and linear sizes. Regular pollution of soils leads to formation of new kinetically stable organic and organic-mineral soil structures, having uncharacteristic of natural soil features. It’s a fact, that there is a progressive formation of new types of functioning organic-mineral soil systems, which did not previously exist in nature.

GE-27
GEOCHEMICAL INDICATORS OF ANTHROPOGENIC APPOINT IN THE TATUOCA RIVER FROM ACTIVITIES OF THE INDUSTRIAL PORTUARY COMPLEX OF SUAPE, BRAZIL.
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The Industrial Port Complex of Suape (CIPS), shelters a variety of activities capable to interfere in the sanitary of the receptor aquatic bodies, like Tatuoca, being able to indicate the distribution of the metals deposited and their eventual impacts. Four sedimentary cores were collected along Tatuoa river with the aid of sampling percussion equipment, soon afterwards they were split up in intervals of five centimeters composing a total of 33 samples, that were analyzed in ICP/AFS for determination of 16 chemical elements (Al, Ba, Ca, Cr, Fe, K, Li, Mg, Na, Ni, Pb, Sr, V, Zn, Zn, Zr) besides the contents of organic matter and granulometric fractions. Through the statistical analysis, it was verified a separation among the chemical species Zr, V, Cr, Fe, Ni and Pb of the other species analyzed in this work, causing a different grouping among the species and profiles 1 and 2, once the elimination of the matrix effect better evidences the affinity of the elements according with the geochemical background. It can be suggested that the chemical species Zr, V, Cr, Fe, Ni and Pb are indicative of terrigenous contribution. These results will be used as geochemical tool in the delineation of areas with larger degree of anthropic influence, subsidizing the management of environmental impacts in CIPS.

GE-28
TRACKING HEAVY METALS POLLUTION IN THE OGU/DU WETLAND, LAGOS NIGERIA USING SEDIMENTS
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Wetlands are usually intensely impacted due to their strategic transitory locations and roles as depository for land derived waste materials. These make them active recipient, accumulators, and potential source of heavy metals for plant uptake, and in some cases ground water contamination. This study is aimed at assessing the concentration, intensity of impaction, and distribution of heavy metals in the study location via vis their potential health implications. Six sediment cores were obtained from the study area using 30x10cm core barrels. The core samples were subdivided at 5cm intervals. These resulted in 30 sub-samples which were prepared and analysed using ICP-MS. An assessment of the intensity of contamination or pollution was undertaken using Enrichment Factor (EF), Geo-accumulation Index (Igeo), and Pollution Load Index (PIL). Furthermore, a geochemical profiling was employed to assess the concentration of heavy metals in sediments against depth. The geochemical analysis revealed that the evaluated heavy metals surpassed their natural background. The Geo-environmental assessment indices revealed that Cu, Pb, and Zn have significant environmental implications. The geochemical profile plots for the sampled locations displayed a predominantly increasing upward trend which indicated an increase in the concentration of the soil’s heavy metal content due to recent increase in anthropogenic activities within the area. Anthropogenic activities that are indited for these metal concentrations include fossil fuel combustion, improper disposal of household and industrial wastes.

GE-29
ARSENIC CONCENTRATIONS EVOLUTION PRESERVED IN ESTUARINE SEDIMENTS CORE PROFILES IN THE ALAGOAS AND PERNAMBUCO STATES, BRAZIL.
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Arsenic and metallic elements (Ni, Cu, Zn, Pb, Cd) concentrations were investigated on basis of samples from a three bottom core drills of 45 cm depth, analysed in estuarine sediments of the Alagoas and Pernambuco states, Northeast Brazil. A background value proposition was estimated for relatively well sediments preserved in these aquatic systems under tropical estuarine conditions. The Batoagof and Jaboatoo rivers stay in Pernambuco and Manguaba river in the Alagoas State. All these profiles (45 cm) is mainly comprised by organo-pelitic sediments and its colors are shades of grey and black representing the last 100 years of the estuarine sedi-
mentation. Sedimentary records are strongly controlled by hydrodynamic constraints, very low currents inducing organo-pelitic sediments and the relatively high currents producing quartzose silts and sands. The analyzed chemical species generally had an increase in their concentration from the base to the top in all profiles, with the increase of organo-pelitic sediments. The chemical species shows a close correlation with Al$_2$O$_3$ (r > 0.90, generally), as consequence of adsorption by clay minerals and organic matter. In absolute terms, the arsenic levels reach values of approximately 22 mg kg$^{-1}$, exceeding the threshold ERL (8.2 mg kg$^{-1}$), with growing trend, setting up an environmental alert. Except for As, the concentrations of all elements are under the USEPA’s ERL level. This result is influenced by small geogenic factors (rock weathering) and anthropic factors (industrial sources, urban sewage and fertilizers) but is representative of relatively well preserved in these hydrographic basins.

EG-30

EVIDENCE OF ANTHROPOGENIC CONTAMINATION BY CHROMIUM PRESERVED IN ESTUARINE SEDIMENTS, JABOATÃO RIVER, PERNAMBUCO, BRAZIL

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Two sub-recent sediments cores were collected from Jaboatão River estuary in order to determine the vertical distribution of metals (As, Cr, Pb, Hg, Ni and Zn) in estuarine sediments and to estimate the degree to which sediments are contaminated. The major elements and particle size were also analyzed. To assess the extent of anthropogenic pollution, the enrichment factor (EF) and toxicological reference values (SQG of USEPA) for river sediments were used. Al-normalized enrichment factors (EF) of metals were calculated based on average upper crust and two regional average values for pre-industrials estuine sediments. The vertical distribution of fine fraction shows a gradual increase from the bottom to the top, while the Al/Si ratio presents an opposite behavior. Mn and K remain constant throughout the sediment profile. Fe, Mg, Cu and Na did not vary greatly with depth. Ce, Ni, Pb, Hg, Zn, Ca, Na, Mg, Fe, Al, and Ti are associated with the fine size fraction while the As is more related to the coarser fraction. Metal concentrations were highly variable especially for Cr (30-743 mg kg$^{-1}$). The EF values are typically under 1 for Ni, Zn, Pb, Hg indicating that these metals show no enrichment while other metals such as Cr present severe enrichment in most samples when compared to the upper crust reference values.

Thus, the Jaboatão River sediments were contaminated by this metal by anthropogenic sources and the sediments are not of good quality in terms of content of arsenic.

EG-31

MERCURY IN BLACK SHALES OF BALTIC PALEOBASIN

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Toxic properties of black shales (BS) are known since the ancient times. The influence of mercury – even in small amount – can cause serious health problems and, in particular, this poisoning is a threat to fetal development and child development in the early stages of life. Mercury can have a toxic effect on nervous, digestive and immune systems, as well as lungs, kidneys, skin and eyes. Mercury is one of the most dangerous elements-pollutants of the biosphere with the highest toxicity among heavy metals, due to its chemical and geochemical features.

Baltic paleobasin of the dictionary name black shales is located in the south-western and southern periphery of the Baltic crystalline shield and belongs to Vendian-Paleozoic platform cover. Sediments of the upper Cambrian lower Ordovician extend from areas of southern Sweden and Estonia to Leningrad region (Russia). Dictyonema shale is a carbonaceous-argillaceous rocks containing up to 25% of the organic matter, clay and silty-sand particles. They contain illite, kaolinite, montmorillonite, chlorite, quartz, feldspar, pyrite, calcite, iron oxides and hydroxides, and carbonate, silicate, phosphate and sulphide concretions. According to M.K.Mertes and Y.V. Fadina mercury concentration in black shales (BS) is quite high and reaches 0.27 ± 0.03 ppm (2009). In soils of Kajaran, Yerevan, and Gyumri. The latter two are industrial and urbanized cities, while Kajaran is located near Mo-Cu combine. Risk assessment model of US EPA was used, and as a preferential exposure pathway, soil ingestion was choosen. The result showed that multi-elemental non-carcinogenic risk (H-1) of adults observed in 4- sampling sites both for Yerevan and Kajaran while in Gyumri H-1. For children, non-carcinogenic risk ranges 1.1-22.1 (mean is 2.3) for Yerevan, 0.8-7.4 (mean is 1.6) for Gyumri, and 2.9-21.3 (mean is 6.8) for Kajaran indicating possible adverse health effect for children in whole area of all cities. The riskiest elements were Pb and Cr in Yerevan, Pb in Gyumri, and Mo in Kajaran. The high Mo concentrations in Kajaran can be the result of geogenic input as well. The results obtained highlight the need for further detailed studies.

EG-32

ULTRASONIC STUDIES ON B-CYCLODEXTRIN/ HYDROXYAPATITE COMPOSITES FOR POTENTIAL WATER DEPOLUTION

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This paper presents structural, morphological and preliminary ultrasonic characterizations of the β-Cyclodextrin/hydroxyapatite (CD-HAp) composites synthesized by an adapted co-preparation method. The structural and morphological properties were evaluated by Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDAX). The novelty of our study consists of preliminary ultrasonic measurements conducted on CD-HAp composite uniformly dispersed in distilled water. The benefits of this non-destructive method could facilitate the modernization of the characterization techniques of different nanoparticles. Our experiments proved that the removal efficiency of CD-HAp composites with respect to lead was dependend on the initial concentration of lead. Considering the behavior of both the hydroxyapatite (HAp) and β-Cyclodextrin (βCD) possess, with respect to potential environmental applications, this paper is focused on the study of a compound based on HAp and two different concentrations of βCD (CD-HAp_1 and CD-HAp_2). At room temperature, the correlation coefficient of Langmuir isotherms (R) for Pb$^{2+}$ removal by CD-HAp_1 had a higher value than in the case of Pb$^{2+}$ removal by CD-HAp_2. On the other hand, the maximum adsorption capacity for the solid phase, qm (mg/g), for Pb$^{2+}$ indicated a higher rate of removal of Pb$^{2+}$ by CD-HAp_2. These adsorption results could bring valuable insight into the beneficial contribution of our compounds for the removal of heavy metal ions from aqueous solutions.

EG-33

HUMAN HEALTH RISK ASSESSMENT OF HEAVY METALS IN THE URBAN ENVIRONMENTS OF ARMENIA

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Soils of urbanized and industrialized areas are bases of environmental quality, and one of its main functions is to maintain human health (HH). In Armenia, in old mining regions and huge industrial cities, human activities lead to the formation of areas polluted by heavy metals (HM). In mining regions, high contents of HM are the result of geogenic and anthropogenic components superposition while in industrial cities HM are mainly from anthropogenic sources. In both cases, although primary pollutants and levels of anthropogenic input are different, increased contents of HM are a risk to HH. Therefore, the risk assessment was done based on the contents of HM in soils of Kajaran, Yerevan, and Gyumri. The latter two are industrial and urbanized cities, while Kajaran is located near Mo-Cu combine. Risk assessment model of US EPA was used, and as a preferential exposure pathway, soil ingestion was chosen. The result showed that multi-elemental non-carcinogenic risk (H-1) to adults observed in 4- sampling sites both for Yerevan and Kajaran while in Gyumri H-1. For children, non-carcinogenic risk ranges 1.1-22.1 (mean is 2.3) for Yerevan, 0.8-7.4 (mean is 1.6) for Gyumri, and 2.9-21.3 (mean is 6.8) for Kajaran indicating possible adverse health effect for children in whole area of all cities. The riskiest elements were Pb and Cr in Yerevan, Pb in Gyumri, and Mo in Kajaran. The high Mo concentrations in Kajaran can be the result of geogenic input as well. The results obtained highlight the need for further detailed studies.

EG-34

CHARACTERISING ALUMINIUM DYNAMICS IN A RURAL STREAM USING CONCENTRATION-DISCHARGE RELATIONSHIPS

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Solute concentration-discharge hysteresis during storm events may be used to infer spatial and temporal dynamics of solute source availability and hydrological pathways. Concentration-discharge behaviour has been intensively studied at storm event scale for sediments and nutrients. However, little information is available regarding metal concentration-discharge hys-
In this study, Al dynamics were investigated in a small rural catchment under humid temperature climate in Galicia (NW Spain) using hysteresis analysis. The majority of the catchment (91%) is occupied by forest (65%) and pastures (26%) whereas 4% is used for cultivation (mostly maize and winter cereal) and the remaining 5% belong to impervious areas. The soils in the catchment are developed on metamorphic schists of the Órdenes Complex formed by easily leachable minerals, such as biotite (sometimes chlorite), plagioclase and amphiboles. The surface soil layer has silt or silt-loam texture, acidic pH and variable organic matter content (4.4-10.5%).

Discharge and Al (dissolved and particulate) data were collected at the catchment outlet during 44 storm events between October 2005 and September 2008. Al (total and dissolved) concentrations were determined by ICP-MS. Particulate Al concentrations were calculated from the difference between Al total and Al dissolved concentrations. The results showed that particulate Al exhibited in most of the storm events clockwise hysteresis loops, reflecting the Al mobilisation from nearby sources to the stream via surface runoff. However, dissolved Al presented more frequently anticlockwise hysteresis loops, as the dissolved organic carbon (DOC). This implies a different transport pathway to the particulate Al, associated with DOC.

EG-35

ASSESSMENT OF THE POTENTIAL BIOAVAILABILITY OF Cu AND Zn BY SEQUENTIAL EXTRACTION IN RIVER BED SEDIMENTS OF A SMALL RURAL SETTING (NW SPAIN)

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Heavy metals discharged into a river system by natural or anthropogenic sources during their transport are distributed between the aqueous phase and sediment beds. To assess sediment-associated metals, sequential extraction procedures are commonly applied and used as a measure of their potential mobility and bioavailability to living organisms. This study presents the results on the evaluation of the geochemical association of Cu and Zn in bed sediments of the upper Mero River (A Coruña, NW Spain). This catchment is located in a small rural setting with 42% of its area devoted to agricultural land (pastures and cultivation) and 53% to forest use. Sediment samples were collected from the top-5 cm of the river bed between the headwater and the catchment outlet. The < 2 mm fraction of sediments was separated and subjected to chemical analysis. To assess the bioavailability of Cu and Zn a six-step sequential extraction procedure was used, distinguishing the following fractions: soluble/exchangeable/specifically adsorbed, residual and organic. The elemental concentrations were obtained by atomic absorption spectrophotometry. The metals here studied mainly occur in the residual fraction suggesting a natural source (geogenic and/or pedogenic origin). The bioavailability of the three metals (considering the sum of the three least mobile fractions, namely, organic matter, crystalline Fe oxides, and residual metals) was decomposed into hot mixed acid (HCl + HNO3 + HF). The residual concentrations were obtained by atomic absorption spectrophotometry. The metals studied here mainly occur in the residual fraction suggesting a natural source (geogenic and/or pedogenic origin). The bioavailability of the three metals (considering the sum of the three least mobile fractions, namely, organic matter, crystalline Fe oxides, and residual) in the sediments decrease in the following order: Cu > Zn.

EG-36

SPATIOTEMPORAL VARIABILITY OF DISSOLVED METALS IN SURFACE Waters of A HUMID AGROFORESTRY CATCHMENT WITH LOW LEVELS OF ANTHROPOGENIC POLLUTION

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Evaluation of levels and spatial variations of metals in the surface waters within a catchment are critical to understanding the extent of land-use impact on the river systems. The aims of this study were to: i) investigate the spatial and temporal variations of five dissolved metal concentrations (Al, Fe, Mn, Cu and Zn) in surface waters of a small agroforestry catchment (16 km²) in NW Spain and ii) establish background levels for these metals in the riverine waters. The land uses include mainly forests (65%) and agriculture (pastures: 26%, cultivation: 4%). Stream water samples were collected at four sampling sites distributed along the main course of the Corbeira stream (Galicia, NW Spain) between the headwater of the stream and the catchment outlet. The headwater point can be considered as pristine environment with natural metal concentrations in waters because of the absence of any agricultural activity and limited accessibility. A total of 272 water samples were analysed during 5-year period. Metal concentrations were determined by ICP-MS. The results showed that, in general, metal contents increased from the headwater to the catchment outlet. Metal concentrations were relatively low (Fe > Al > Mn > Zn > Cu), suggesting little influence from agricultural activities in the area. Metals presented mean concentrations below reference values for world-undpolluted rivers except for Fe and Zn. This threshold was exceeded in the 3%, 5%, 29%, and 84% of the samples for Al, Mn, Fe and Zn, respectively. Metal concentrations do not exceed the quality standards of European legislation for water intended for human consumption.

EG-37

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE TOMBAK VILLAGE (KAHRAMANMARAS) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Değirmentaş village (Sarız-Kayseri-Turkey), in terms of hydrogeochemistry, isotope geochemistry, and medical geochemistry. Water samples of the area were supplied from five different water sources. Isotopic analyses of δ18O and δD (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geochemistry, the iodine contents of Değirmentaş drinking waters are range from 0.75 to 0.82 μg / L. The World Health Organization (WHO) reports that the amount of iodine in drinking water should be at least 10 μg / L. Değirmentaş people living in this area are thought to have been caused by the lack of drinking water in those who have gotten goitre disorder.

EG-38

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE YUKARIKARGABUKU (ANZOREY) VILLAGE (KAHRAMANMARAS) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Yukarikargabıği (Anzorey) Village (Göksun – Karaman-Maras-Turkey), Turkey, in terms of hydrogeochemistry, isotope geochemistry, and medical geochemistry. Water samples of the area were supplied from seven different water sources. Isotopic analyses of δ18O and δD (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geochemistry, it was thought that the hearing levels of Anzorey people exposure to low dose barium and the toxic effect on the inner ear would be high.

EG-39

HYDROGEOCHEMISTRY OF THE DRINKING WATER SOURCES OF THE DEĞIRMENTAŞ VILLAGE (SARIZ-KAYSERI) AND THEIR EFFECTS ON HUMAN HEALTH

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The aim of this study is to investigate drinking water sources of the Değirmentaş village (Sarız-Kayseri-Turkey), in terms of hydrogeochemistry, isotope geochemistry, and medical geochemistry. Water samples of the area were supplied from five different water sources. Isotopic analyses of δ18O and δD (deuterium) were conducted on the samples collected from the region for one year. Water quality assessment parameters such as temperature, pH, conductivity, alkalinity, trace element concentrations, anion-cation measurements and metal concentrations were determined using ion chromatography, ICP-MS, and ICP-OES techniques in order to determine the quality of water sources. During regional investigations, at the view of medical geochemistry, the iodine contents of Tombak drinking waters are range from 0.75 to 0.82 μg / L. The World Health Organization (WHO) reports that the amount of iodine in drinking water should be at least 10 μg / L. Değirmentaş people living in this area are thought to have been caused by the lack of drinking water in those who have gotten goitre disorder.
Trace metal enrichment in sediments impacted by sulfide mining and smelting in the Longjiang River, South China. This paper aims to explore the spatial distribution, source and environmental risk of the selected metals of As, Cd, Pb, Sb, Zn and Tl in the river system. The average concentrations of the six metals were all higher than the background values, especially for elevated Cd (2.0 mg/kg) and Sh (19.3 mg/kg). Enrichment factor values (EFs) of As, Cd, Pb, Sb, and Zn showed that they were highly enriched in the industrialized and urbanized areas, midstream of Longjiang river (3.2, 27.8, 8.6, 27.1 and 8.6 on average, respectively); and Cd also enriched in upstream and downstream (9.1, 14.5 on average, respectively). The metal concentrations in the river sediments showed significantly positive correlations with each other (0.518 ≤ r ≤ 0.845, p < 0.05), indicating that the enrichment may be attributed to the midstream Sh-Pb-Zn metal smelting activities. Other anthropogenic sources such as sewage effluence may also contribute to metal enrichment in sediments. EFs of Tl (0.8-1.0) showed slightly variation in the river and significantly correlated with Ti (r = 0.722, p < 0.01), indicated that Tl majorly originated from geogenic source. The average potential bioavailable fraction of As, Cd, Pb, Sb, Zn and Tl were 21.2%, 45.3%, 38.7%, 28.9%, 41.5%, 9.7%, respectively, and displayed positive correlation with EFs (except for Tl), indicating that the metal enrichment in surface sediments exhibited high environmental risk to aquatic system, especially in midstream.

EG-43

IMPACTS OF SOIL POLLUTION ON HUMAN HEALTH IN IRAQ

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The impacts of regional radioactive pollution, over all Iraq, and a domestic site pollution, 30 km west Mosul city at Northern Iraq, were highlighted in this study. The regional radioactive pollution are due to the Depleted Uranium weapons (DU) used against Iraq since 1991 till 2003. The effects of the regional pollution extended outside Iraq and noticed at the surrounding countries, Kuwait for example. The pollution rate were estimated using an international computer program designed for this purposes. The authorized communities announced that more than hundreds tons of DU missiles were used during 1991, and the rate increased to thousands of tons in 2003, at Southern, Middle and Northern Iraq. While the domestic radioactive pollution was caused by an accident case at (U) radioactive Waste grave. The accident cause releasing and distribution of radioactive waste material on the earth surface of an area 500m x 500m. The two events induce the environmental pollution in air, water and soil. The data show very high equivalent radioactive dose at the Battle Field at Basrah, Zubair and Safwan sites in comparison with the international accepted level of ICRP. Blood samples from persons (male and Female) living near the domestic polluted site were analyzed. The results show a significant abnormalities related to the normal characteristics. According to Mosul General Hospital documented data for that period, this may give an indication for a probability to induce an abnormal increasing in cancer types of some sensitive human body organs. The reported information for the affected 45 organs shows different ratios of response to cancer cases. They are distributed as follows: 10 organs 0%, 12 organs 50%, 10 organs 100%, 1organ 200%, 4 organs 300%, 1 organ 400%, 1 organ 500%, 1 organ 800% and 1 organ 6400%. The latter ratio is related to the skin cancer, which is give a very good indication for the radioactive air pollution in this site specially for radioactive alpha particle emitters within Uranium compounds.

EG-44

IMPACT OF THE LESS IODINE IN WATER FOR PUBLIC HEALTH IN PONOROOGO, EAST JAVA OF INDONESIA

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In Ponorogo, East Java province, there is Karang Patihan village suffer diseases is iodine deficiency. Morphology the area found on the slopes of the hills more than 40%, so estimated minerals needed by the human body is a lot of erosion by streams of rain water, and its location is isolated from the urban areas so that the distribution of nutritious foods often have difficulty. Water samples were taken from the well, drilling; river and spring water, so the results of the iodine analysis are as follows (Iodine in u/L): wells; (SG-1; SG-2; SG-3; SG-4; SG-5) = 26, in the drilling (SB-1) = 44. river water (AS-1; AS-2) = 0 and spring water (MA-1) = 32, all elements of the iodine less than 150 u/L. Where as the needs of iodine per day for health is 150-200 u/L. Information from the local Health Department, the diseases shortage of iodine is 89 people. To improve the quality of health care for the local population, improvement of nutrition and extra iodine salt to be given regularly by the local Health Department so that the next generation of the society will live more healthy and prosperous.

EG-45

WATER AS A SOURCE OF RADIATION EXPOSURE: LABORATORY EXPERIENCE AND METHODS OF RADIONUCLIDE ANALYSIS

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Water plays a crucial role in ecosystems and human health and well-being largely depends on its quality. Both drinking water and water used for industrial and commercial activities make a significant contribution to the total effective dose from natural background radiation. According to UNSCEAR (2008), humans receive up to 30% of the total worldwide average annual dose from natural sources like food and water. In some cases concentrations of naturally occurring toxic radionuclides (e.g. uranium) in water can be very high and exceed national guidelines.
To estimate radiation exposure levels (and other parameters) through ingestion of water the Laboratory of Isotopic Methods of Analysis (LIMA) has developed the complex of effective laboratory radiometric methods of measurement that includes more than 50 certified radiochemical and instrumental techniques recognized by the Russian Federal Agency on Technical Regulating and Metrology (Rosstandart) and featured in the Federal Register list. The complex can be applied in laboratories for various fields of science including geochemistry, radiology, environment studies and medicine. The methods comply with domestic and imported standard analytical equipment, are simple to use and allow obtaining reliable data. LIMA has been improving and refining the complex of methods of radionuclide analysis for more than 20 years through our own comprehensive studies of a large variety of water bodies in Russia and abroad. We analyze natural (artesian and surface) drinking water supplies as well as waste water coming from nuclear facilities, produced water from oil and gas operations, groundwater in areas of uranium exploration and mining and natural water contaminated by the Chernobyl accident.

The collected data includes the results of more than 20,000 tests devised to determine natural and artificial radionuclides (U, Th, Rn, Po, Pb, Pu, Am, Cm, Cs, Sr, etc.), to assess corresponding radiation effective doses and risks to human well-being as well as to provide information on radiological types of drinking water in different regions. This data may be relevant for groups of experts in medical physics and biological hazard protection who study various health-related environmental factors.

EG-46

WELL WATER MANGANESE IN FINLAND

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Manganese (Mn) is a natural occurring element found ubiquitously in bedrock, soil, water, air and plants. It is a neurotoxic element but it is also an essential micronutrient required in trace amount for human health. Mn concentrations greater than 50 μg/L may cause gray color or unpleasant odor or taste to drinking water (DW). Excessive exposure to Mn in DW has been associated with neurological disorders that resemble symptoms to Parkinson disease (PD) such as tremors, difficulties in walking and facial muscle spasms. Among children, exposure to Mn at levels common in DW has been associated with intellectual impairment. The ground water data was obtained from the database of the Geological Survey of Finland (GTK). The data of KAI-MA-project consists of 5311 single samples including analysis from 2383 bedrock drilled wells and 2926 Quaternary deposit wells i.e. dug wells, springs, captured spring wells and Quaternary drilled tube wells. The number of monitoring samples was 4607 including 380 bedrock wells and 4227 Quaternary deposit wells. Manganese was mainly analysed as soluble form, but in few samples also total Mn was analysed. About 41 % of single water samples of drilled wells and 17 % of Quaternary deposit wells exceeded the Finnish national regulation of 50 μg/L for Mn. Preliminary results from monitoring data indicate that Mn concentrations have clear annual and seasonal variation. The findings showed that Mn was mainly in soluble form. In samples with high Fe concentration the manganese was bounded in particles and caused higher total Mn.

EG-47

AGRICULTURAL SOIL GEOCHEMISTRY OF TRACE ELEMENTS: ACCUMULATION PATTERNS IN CITRUS, OLIVE GROVES AND VINEYARDS FROM PELOPONNESE, GREECE

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Various agrochemicals, including fertilizers, pesticides and fungicides are commonly applied to agricultural land to promote crop growth and ensure successful harvests. However, their long term application is a contributor for trace metal accumulation in the receiving soil. We investigated the concentration levels of a large suite of trace metals (Cr, Pb, Zn, Cd, P, Ni, Cr, Co, Mn, As) in citrus (n=64), olive (n=61) and vineyard (n=40) calcareous soils collected from Peloponnesian area, Greece, aiming to explore the influence of agricultural practices on the chemistry of soil from each crop category. Enrichment Factors (EF), calculated using unselected soils, showed that the vineyards and citrus soils are more susceptible to Cu, Cd and P accumulation compared to the soils cultivated for olive trees. Copper (range 42-275 mg kg⁻¹ and 33-291 mg kg⁻¹ for citrus and vineyard soils, respectively) was found to be the most significant enriched trace metal as result of anthropogenic inputs related to the application of Cu-based fungicidal sprays. Application of a sequential extraction to selected vineyard soils showed that the major geochemical hosts of Cu were the amorphous Fe oxides (34% of total Cu), followed by organic matter (25% of total Cu). Availability of Cu (defined as HNO₃, EDTA and HA- extracted Cu), in the agricultural soils was comparable to that of highly urbanized soils from the city of Athens, indicating that similar sequestration mechanisms might influence the geochemical reactivity of Cu deriving from agricultural activities in the rural environment and traffic related sources in urban settings.

EG-48

ABOUT SCIENTIFIC HERITAGE OF THE EMINENT GEOCHEMIST AND MINERALOGIST STEPAN BADALOV

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BIOGEOCHEMICAL ROLE AND IMPORTANCE OF THE ELEMENTS WITH VARIABLE VALENCE AND UNSTABLE ISOTOPES IN HUMAN ORGANISM

Unstable isotopes were divided into 2 groups according to the effect they produce on human organism:

1. 12 isotopes with nuclear decay, more harmful than useful, from the most dangerous Radon to Platinum-190, and
2. 9 isotopes with isotopic transformations, more useful rather than harmful, from Potassium-40 to Lutetium-176.

The most active isotopes, having the shortest periods of semi-decay were discussed. Isotope dynamics were transformed by organisms at a rate of over 400,000 times per minute. These processes generate 23 new isotopes of other elements, some of which are useful, while others are detrimental for the organs and systems, where they originated. Out of more than 36 elements with variable valence, approximately 20, including Iron, Sulphur, Copper, Vanadium, Manganese, Cobalt, Molybdenum, Selenium, Gold, Phosphorus and others play the most critical role for various organs and systems of human organism.

The elements with variable valence (Iron, Manganese, Vanadium, Sulphur, etc) play important role both for the organism, and for separate organs. Their role is to either absorb or release Oxygen during the processes accompanying the changes of valences. Amounts of some of these elements are so negligible, e.g. Manganese in blood is only 0.0x mg / L that they can only work as catalysts facilitating activity of the most vital organs. Gold (both Au⁺ and Au³), Vanadium, Manganese, Molybdenum (from 2 to 7), Selenium, Titanium, Rheinum, and other elements also play a vital role.

Illustrated by 2 Tables

Table 1. Distribution of the chemical elements and their isotopes in human organs and systems (in descending order of their importance)

Table 2. Unstable isotopes of the chemical elements (in descending order of their importance for organs and systems)

EG-49

BIOGEOCHEMICAL ASSESSMENT OF THE IMPACT OF CISCARPATHIAN LANDSCAPE ON POPULATION HEALTH

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The chemical composition of soils and natural waters affects the biochemical processes in phyto- and zoocenosis of certain areas. Regularities of disease spread among the population of Carpathian are consistent with three landscape groups – mountain, foothill and plain. Carpathian flysch rocks are the main source of dispersed elements that enter the environment according to research, the sediments of Cretaceous, Palaeogene and Neogene period contain concentrations of Ti, Cr, Cu, Ni, Ga, Zr and Ba that are equal to bulk earth values, but Ba, Mg, V and Sr compose less than bulk earth value. Abrupt changes of dispersed elements content are observed during the gradation from rudstones of Styrike suite to silstones and sandstones of Yarmenska suite, namely, the concentration of Mn decreases by a factor of 42, Cu – 21, Ba, Mg – 16, Ni – 3 and Ti – by a factor of 2. Along with the transition to the Quaternary sediments, concentration of trace elements in rocks significantly reduces and is not exposed to sudden changes in the entire their vertical section.

Livelihood of dispersed elements is increased in the weathering crust. In mountainous landscapes Sr is extensively washed from rocks, Mn and Cu are less washed; Ti, Cr and Vu are poorly included into water migration. The intensity of elements removal decreases along with transition to plains. The intensity of trace elements involvement into migration is associated with rocks weathering. In mountainous landscapes the weathering crust coincides with the soil. Sr has the highest migration ability in Carpathians, then Mn, Cu, Ba, V and Pb follow in descending order.

According to the research, along with absolute landmarks increasing, water migration factors of micronutrients are increased. After passing to the soluble state trace elements reach the drinking water.

Groundwater mineralization significantly increases along with the changes in mountain landscapes on foothills and plains. In the direction from mountains to plains the content of Sr, V and Ba in groundwater decreases and the content of Ni, Pb and Mn increases. The highest concentration of Cu, Cr and Mn are typical for groundwater of mountain landscapes.

Climatic conditions and mountainous relief of Ciscarpathia contribute to the rocks weathering and transition of trace elements into moving (mobile) form. In mountainous landscapes plant species composition is determined by mineralogical and chemical composition of soil formation rocks and intensity of their destruction. Soil depth in this area is shallow, granulometric composition is insignificant. All this is characteristic of high mountain Phytocenes, which are characterized by a high content of V, Sr, Mn and Cu.

In lowland landscapes of Carpathia the conditions of phytocenes are associated with increased concentrations of Mn, Ba, Cr and Pb in soils and groundwater. Groundwater miner-
alization in this area increases almost threefold in comparison with the mountainous area. The processes of dispersed elements migration are slowing down. Areas with high concentration and dispersion of trace elements are typical for lowland landscapes. Concentrations of V, Sr and Cu are smaller in plain area phytocenoses in comparison with highland phytocenoses. Plants are the food of humans and animals and are used to produce drugs. Qualitative and quantitative composition of compounds, synthesized by plants, depends not only on their type, but also on the composition of nutrient medium. Plants affect human and animal health by means of biologically active metabolites. Plants and animals are often affected by the thrombolethritizing diseases; they rarely suffer from leukemia, lymphomatomoid granulomatosis, malignant myopia, acute attacks of glascoma, malignant neoplasms, brain and spinal cord tumors and neoplasms. Population of foothill area often suffers from leukemia and malignant myopia, population of plains suffers from chronic and acute attacks of glascoma, gastric and lung cancer, tumors of brain and spinal cord and neoplasms, rarer – from thrombolethritizing diseases. The results of medical and geographical studies give reason to believe that the prevention of blood system diseases, ophthalmology and dental diseases among the population via selection of diet with optimal micronutrient content could be quite promising.

EG-50

AN ARSENIC GEOLOGIC PROVINCE IN NORTHERN MEXICO AND THE IMPLICATIONS OF LOW LEVEL EXPOSURE IN DRINKING WATER: INSIGHTS FROM A MURINE MODEL

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In this work, a Geographic Information System and a database of stream sediments were used to generate an arsenic map of the state. The highest As contents were constrained to the Yaqui basin which is the main source of water for the state and for the most important agricultural area in Mexico. The hydrologic Yaqui basin hosts some of the most important copper-dominated deposits that can be considered part of a larger belt of intrusion-related ore deposits of northern Mexico and southwestern United States. Drinking water has been considered as the predominant pathway of human exposure to environmental metals in agricultural areas at arid regions. In this work, As-content of drinking water was analyzed from three indigenous towns located at the Yaqui agricultural valley. Water contains low levels of As when compared to areas such as Bangladesh, Argentina and Comarca Lagunera in Mexico. However, previous research show negative health effects for low dose and chronic exposure to As. To evaluate the health effects, mice were exposed to drinking water with low, medium and high As contents (0.075, 0.012 and 0.006 mg/L, respectively). The mice presented behavioral changes, such as pilo erection, Straub sign and aggressiveness. Those alterations coming from the interaction of animals and a neurotoxic agent. The results from this work shows that the Yaqui basin is a geological arsenic province that deserves further research, mainly because nearly 50% of Sonoran population live in cities and towns that are located within this province.

SD-02

ADEQUATE TECHNICAL FOR WATER MANAGEMENT REDUCE PUBLIC HEALTH PROBLEMS IN NORTHERN MEXICO


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To evaluate the potential use of appropriate technology (water cistern) as one forms of water supply of the Brazilian semi-arid region diffuse population, was efected by the UFPE, a search in the village of Mutuca, municipality of Pesqueira-PE. Four investigative sections have been consid- ered: technical vision, where they discuss the potentialities and diffi culties of the employment; the anthropological vision, related to the acceptance of the population as an essential condition to the success of the development; the third vision addresses the aspects of public health, with indicators of the hospitalization in the region; the fourth vision encompasses the operation and maintenance of infrastructures where are addressed and discussed successes and failures. As a result it could be observed that the hydrological point of view, it is not possible to implement all households which have a roof with at least 40m² of area, with daily guaranteed withdrawal less than 50 l/day, whereas occurrence of failures of up to 40% in time were observed in simulations. In micrometric areas up to four tanks could be supplied. Highlight the diffi culties inherent to the operation of tankers, with contamination by roofs. A real decrease in the numbers of cases of childhood diarrhea was verified in the units where the care recommended for the management of tanks were followed by families object of study.

SD-03

CHEMICAL QUALITY OF MINERAL WATERS IN THE METROPOLITAN REGION OF RECIFE – PE


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The Metropolitan Region of Recife (RMR), formed by 14 municipalities, was originated by several depositional environments that make up the coastal sedimentary basins of Paraiba (North) and Paraíba do Sul (South), separated by the structural divisor Pernambuco Shear Zone, sheltering the Cabo, Beberibe, Barreiras, and Boa Viagem fissured aquifers with distinct hydro- dynamic characteristics, and that mainly since the 90’s have been contributing effectively to the supply of mineral water. Data from the International Association of Bottled Waters show that Brazilian demand for bottled waters grows more than 7% per year. Brazil is already the 4th largest market where five billion liters of mineral water are consumed each year, per data from the Brazilian Association of Mineral Water Industry. In the RMR, there are conflicts in the exploitation of the important Beberibe aquifer, where there are the largest reserves of mineral water and consequently, a greater exploratory demand. The indiscriminate use of these aquifers has caused serious damages, among them, the piezometric lowering and the variation of the hydrochemical parameters of the water. The chemical quality of the water, determined by the quantity and quality of the mineral salts such as calcium, sodium, potassium and magnesium, are within the standards established by the Brazilian drinking water legislation. Most of the mineral waters present a pH with values between 4 and 6, per the standard set by the Ministry of Health. In RMR most mineral waters have a good chemical quality, offering no risks to human health.

SD-04

STUDY OF RADON CONCENTRATION IN BAMA MINE

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Radon is a naturally radioactive noble gas, that can not see, smell or taste it. It can be revealed only by special devices. Radon gas produces by radioactive decay of Radium and Radium product from Uranium decay. The amount of radioactivity in air by Radon gas measure in Bq/m3 of air. Evidence of high level of Radon and radiation associated with an increased risk of lung cancer has caused concern. In fact what about the health risk of Radon radiation is known is more than other carcinogenic. So, checking Radon gas in different region, especially in areas that are occupied by different people, both for employment and for life is essential. The study mine is located 20 KMs
southwest of Isfahan and into Irankhoo mountain range. The purpose of this study is to measure amount of Radon gas in indoor air of Bama lead and zinc mine and the environment surrounding it, and compare the amount of Radon in mine air with its critical level. This critical level produced amount of Radon gas in indoor air of Bama lead and zinc mine and the environment surrounding mine. The most important particle radiation from radon gas is Alpha particles deliver more types of radiation damage can be considerable. Although alpha particles cannot penetrate to great depth in tissue, but mass and high charge of them can be a large ionization.

Gamma rays have great penetration power, their ionization and damage to tissue is comparable to the effects of X-rays. Gamma rays usually have more energy than X-rays, radioactive sources are paced outside the body, gamma radiation from these sources is the biggest problem, due to the high penetration of gamma rays can be dangerous. While penetration capability of alpha particles is very limited in matter. Thickness of the body tissue to different depth and of course are a type of risk of external radiation. Radiation by radon. Most radon is inhaled, given out and the relatively small number of alpha particles emitted by radon gets into the body. Four decay products of radon, have a short half-lives and all solid elements are radioisotopes.

The decay products may be as independent particles and suspended in the air or by binding to the surface of dust, smoke and moisture enter the respiratory system and trapped into lungs and cells of mucous members, and other lung tissues are irradiated. The mortality rate of some miners from lung cancer has been recorded in early middle age in Germany and Czech republic, has been as deaths due to radon gas. Studies on thousands of miner in Australia, Canada, China, Europe and the United state, in uranium, iron, tin and fluorite mines has been in a 30-year period. These studies, despite several differences in study populations and methodology, prove increase in lung cancer with radiation by decay products of radon. It is interesting to note that radon gas as a chemical product remains for decades and even in mineral water springs is significant as a therapeutic agent. Alpha particles decay by radon that are inhaled can be a serious threat for the respiratory system and does appear to be essential in lead mines. In this study, radon concentration in lead and zinc mine is measured. The oldest rocks in this region belong to the lower Jurassic that formed of black shale with siltstone and sandstone and is exposed only in the northern mountain range. These shale are consistent with Shemshak shale. Middle and upper Jurassic formation has not been seen in this region. Cretaceous carbonate rocks that are essential rocks in this region with unconformity are located lied on the lower Jurassic rocks. This sediment belongs to the Barremian to Albian age. Their thickness is about 800 meters, and is formed from limestone and dolomite with a little shale and salt.

Measurement of radioactivity. There are several different methods for measuring radioactivity:
1. Radioactivity of a radioactive substance such as radon gas.
2. Received dose by tissues such as the dose received by lunges from solid decay products of radon.
3. Radiation is caused by radioactive and radiative thresholds for health, safety and environment, such as dose limit that used as low and information.

Radioactivity in the United States is typically measured in terms PCI. CUR unit has been named after French physicist, Marie Curie she was a pioneer in research on radioactive elements and their decay. In most countries Becquerel used as the metric unit (S). One Becquerel show decay of an atom in a second. Becquerel refers to the amount of radioactivity that will decay an atom per second. Radioactivity levels in air caused by radon gas is measured per unit Becquerel per cubic meter of air. Average radon concentration in homes in great britain is 20 Bq/m3, that indicate the decay of 20 atoms per second in a Bq/m3 radon, nearly 2 million radon atoms that decay per minute. Radiation and radon gas effects on human health. Alpha particles deliver more types of radiation damage can be considerable. Although alpha particles cannot penetrate to great depth in tissue, but mass and high charge of them can be a large ionization.

Alpha radiation can not penetrate to the surface layer of skin, but inside the lungs that does not protective lining, alpha particles decay by radon that are inhaled can be a serious threat for the molecules inside the cells of the lung.

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The rapid effects of high doses of radiation of humans that can cause to be death or visible skin damage in a few days or weeks, but when a body part are affected by low radiation doses, radiation effects, will occur sometime after radiation. Radon gas present in the environment, has a late effect from the second type.

Although lung cancer related to radon gas occurs in the upper airways. But radon increases occurrences of other types of lung cancers from histologically. Thus, the views expressed, the result is, survey and control of radon gas is necessary in different regions particularly in region were people for employment or for life be occupied.

Methods for measuring radon gas. The most important particle radiation from radon gas is Alpha particle with 5.486 MeV energy. Several detectors have been used in this area. However, radon can also decay, gamma particles, that very weak and their energy is about 0.51 MeV. Some detectors with measuring of gamma radiation can reveal radon concentration.

Rad 7. Device, including devices that can be measured radioactivity by its. This device is made in different models and designs, use for determine radon and thoron concentration in air and 7th International Conference on Medical Geology "MedGeo2017"
soil air. This device has a air suction pump. The suction air passes through chamber that made from materials such as moisture retention (charcoal). The air enters into counting chamber. Chamber is a detector can be a needle cell or an ion. Alpha particles hit to the detector and created signals that process by the device electronic system and ready to be recorded. Information stored in the memory device. The device was equipped with printer and screen and show information by two methods.

Discussions. Data was measured in two cases, Thoron and radonmetry, in Gadéll underground mine from Bama company mines y radiometer device, this measurement took in several hours at different heights above sea level. Conclusion are shown for each horizon. Thoron is one of the radon radioisotopes and is natural radiation gas, a member of the long chain of natural radiation thorium isotopes. Studies show that always on the side of radon, there is thoron, and its concentration is equal or even more than radon. At altitude of 1500 meters above sea level, the amount of radon was measured during a day. thornometry of device in this mode is shutdown.

This measurement start from 15 pm on Sunday, 15th January, 2011, and finished at Sunday, 15 pm, 16th January, 2011. The device read automatically every 1.5 hour. In 24 hours, 16 reading were recorded. Results show that the radon concentration begins to increase from 1 am and reach to maximum at 7 to 9 am. Decreases again in the afternoon. radon concentration reaches from lowest, 16 Bq/m3, in the evening to 16 to 18 pm, to its maximum 43.3 Bq/m3 at 7 am. Rate change over the horizon of 1500 meters in 24 hours are 27 Bq/m3.

Conclusion. In this study, concentration of radon is determined based on allowed American environmental protection agency 9EPA). Values obtained within 2 days in different parts of mine should be investigated. Its due to low ventilation in the end of channel.

a detector can be a needle cell or an ion. Alpha particles hit to the detector and created signals that process by the device electronic system and ready to be recorded. Information stored in the memory device. The device was equipped with printer and screen and show information by two methods.

SD-05

RISK ASSESSMENT FOR CHILDREN EXPOSED TO TRACE ELEMENTS IN AN URBAN, MULTI-PATHWAY EXPOSURE SCENARIO (MADRID, SPAIN)

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In order to assess the health risk for children (age 6-months to 2 years) in urban environments, samples of commercial baby food (samples from four categories i.e. fish, meat, fruit and vegetables, and powdered milk and cereal pap), soil from playground areas and household dust were collected. Lyophilized infant food and dust samples collected in wet wipes were digested with HNO3 + H2O2, and powdered milk and cereal pap), soil from playground areas and household dust were collected. Mercury determination was done by Instrumental Neutron Activation Analysis (INA-AS) and by cold vapor atomic absorption spectrometry. The sampling was done in medical centers, plants, schools, pre-school centers in Moscow, the Moscow and Vladimir regions. About 900 samples were taken in whole. All procedures of sampling, samples transportation and biological material preparation for the analysis were done according to actual national requirements, international- al ISO standards and the methods described in “Standard operations procedures” (SOP) which are used in DEMOCOPIES program and recommended by World Health Organization (WHO). All participants of the research signed a special voluntary agreement. They also filled up personal questionnaires about their social and professional position. Children were involved only with a consent letter of their parents, private questionnaires were also completed.

No evidences of a high mercury exposure impact on the human body in Moscow and the towns of the Moscow Region were found. Presumably, the obtained mercury concentrations in the biomaterials mainly are due to consumption of fish and seafood. The complex of biomaterials studied in the article reflects levels of entering the human organism of all mercury forms. Nails and hair samples are interchangeable biomaterials in assessing the mercury impact on the human organism but it is difficult to remove dirty from the nails’ surface. Therefore, if the amount of hair samples is sufficient it is possible not to analyze nails samples.

SD-07

PIGMENTS AS SOURCES OF LEAD AND HEXAVALENT CHROMIUM IN URBAN DUST

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High concentration of hexavalent chromium as crocote micropipettings in traffic yellow painting is reported in urban dust and air filters from a developing city located in the Sonoran desert. Erosion of asphaltic cover is enhanced by climate, and the presence of mineral crocote (PbCrO4) in road dust at an aerodynamic diameter smaller than <1 µm suggests its integration into the atmosphere by wind resuspension processes. Cr content in street dust reported on this work is higher than most of the concentrations previously published worldwide. Crocote as micro and nanoparticles in dust was identified by combined techniques of Raman microspectroscopy, ARD, and SEM. A positive Pb-Cr correlation was found for all studied samples, and Pb-isotope data show a crocote signature in urban dust and air filters, thus representing an ingestion and inhalation route of lead and hexavalent chromium for human exposure. The presence of hexavalent chromium and lead in traffic yellow paint used in Latin America has not been previously addressed, and it represents an unknown health risk to exposed population.

SD-08

PEDESTRIAN EXPOSURE TO METALS AND CATALYST-DERIVED MINERALS BY DUST SUSPENSION AT ARID ZONES: IMPLICATIONS FOR HUMAN HEALTH

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Understanding the potential impacts of polluted dust on human health is critical for semiarid zones because climate change promotes dust suspension. Such areas are characterized by the occurrence of rainfall of short duration and high intensity followed by high evaporation rates during monsoon season. The climate promotes a cycle of erosion, surface runoff, dust deposition in urban basins and further evaporation leading to dust suspension by traffic. Hemosilico is located within the Sonoran Desert and it is characterized by a high incidence of diabetes, cardiovascular and neoplasm when compared with other sites in Mexico. These three diseases can show complications by traffic exposure. In this study, airborne dust was collected at two different heights (pedestrian and...
The main factors of anthropogenic impact on climate are: increasing concentration of greenhouse gases and increased emission of aerosols into the atmosphere. Increased concentrations of these gases lead to increased absorption of radiation from Earth. This causes heating of the atmosphere and hence the Earth’s surface.

Currently it is generally acknowledged that the growth of greenhouse gas emissions in the twentieth century is the result of human activity, but there is no clear correlation between the Earth temperature change and the increasing concentration of greenhouse gas emissions.

Certainly, the local impact of anthropogenic and technogenic human activity on climate (creation of artificial reservoirs and dams on rivers, deforestation, etc.) can be essential, but there is no point in overestimating human potential in comparison with the natural factors. But the anthropogenic effect could provoke climatic changes and cause a new cycle of warming.

Rise of temperature creates favorable conditions for disease development, which contribute not only to high temperature and humidity, but also to the expansion of habitat of animals hosting the disease (e.g. malaria).

Increased development of the microflora and lack of clean drinking water will foster the growth of infectious intestinal diseases. Rapid proliferation of microorganisms in the air may increase the incidence of asthma, allergies and various respiratory diseases.

In the future it is planned to pay much attention to greenhouse gas capture that emerge during electric power production and directly from the atmosphere in via plant disposal, use of oxygenic artificial trees and carbon dioxide injection to deep ocean depths, where it will dissolve in water columns.

### SD-09

**ASSESSMENT OF PTE LEVELS OF URBAN STREET DUSTS FROM TWO CITIES OF PORTUGAL: POTENTIAL HUMAN HEALTH RISKS DETERMINED BY ORAL BIOACCESSIBILITY**

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**ABSTRACT**

Urban street dust is a complex mixture consisting of suspended particles (aerosols), and displaced soil and biogenic materials of low grain size fraction, which can be easily mobilised and easily inhaled ingestible by people.

In this work the potentially toxic elements (PTEs) levels and its oral bioaccessibility in urban street dust samples collected in two nearby Portuguese cities were determined. Under similar geologic features the two cities (Estarreja and Aveiro) located in the central coast of Portugal differ in the type of anthropogenic processes. Estarreja, with a greater influence of industry and agricultural activities, has an area of 20.2 km², and about 7500 inhabitants. In this city is located one of the biggest chemical industrial pole of the country, which left an environmental contamination legacy, resulting from more than 85 years of industrial production. This represents a constraint for the agricultural practices (a very important activity in the region) and a risk to human health. About 20 km away from Estarreja is located Aveiro, with an area of 45.32 km², and a population of 18,756. Although the ceramic industry, the production and processing of metals and pulp and paper industry are the main industrial activities of the municipality of Aveiro, in the city the main anthropogenic processes are associated with traffic and building construction.

In both cities, the sampling was conducted in the urban areas: in Estarreja about 4 km² and in Aveiro 3 km². The results showed that levels of Cr, Ni, Fe, and Pb are quite similar between cities, whereas high levels of Zn and Mo were found in Estarreja, while Co and Au is higher in Aveiro. Anyway, a high inter-elemental variability of PTEs contents is verified in both cases. The oral bioaccessibility data is also very variable between PTEs and intra-city.

### SD-11

**HEALTH CONDITIONS OF TOUR MANAGERS LEADING INTERNATIONAL TOURS TO DIFFERENT GEOGRAPHIC AREAS**

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Tour managers are frequently exposed to various health hazards associated with travel, but data on their health conditions are limited. We conducted a survey on tour agency employees in Taiwan to understand specific health problems in the tour managers with specific tour-leading areas. A total of 152 tour managers participated in this study. The main tour-leading area of a tour manager was defined as the area with the greatest tour-leading percentage reported by the tour manager. When a tour manager had two or more main tour-leading areas, the tour manager would contribute to two or more samples in the analyses. Finally, we got 110 tour managers mainly leading tours to China, 18 to North-East Asia, 33 to South-East Asia, 1 to North America, 6 to Europe, and 3 to New Zealand/Australia. Considering the power of statistical analysis, we only made comparisons among the tour managers leading tours to China, North-East Asia, and South-East Asia. The result showed a significantly higher prevalence of recent cough (in the past three months) reported by the tour managers leading tours to North-East Asia compared to those leading tours to other areas. The adjusted odds ratio was 14.9, with 95% confidence interval of 3.1-70.7 (p < 0.01).

### SD-10

**IMPACT OF CLIMATE AND TECHNOGENIC ACTIVITY ON POPULATION HEALTH**

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Active climate changes take place on our planet. And there are many theories around this process, including global warming.

The reasons for climate change are mainly thermodynamic processes on Earth and external impacts, such as fluctuations of the solar radiation intensity and possibly human activity.

The sun is the main energy source for absolute majority of processes that occur on Earth, it depends on the development and existence of all living things. The temperature increase takes part in the global warming process, including global warming.

The main factors of anthropogenic impact on climate are: increasing concentration of greenhouse gases and increased emission of aerosols into the atmosphere. Increased concentrations of these gases lead to increased absorption of radiation from Earth. This causes heating of the atmosphere and hence the Earth’s surface.

Currently it is generally acknowledged that the growth of greenhouse gas emissions in the twentieth century is the result of human activity, but there is no clear correlation between the Earth temperature change and the increasing concentration of greenhouse gas emissions.

Certainly, the local impact of anthropogenic and technogenic human activity on climate (creation of artificial reservoirs and dams on rivers, deforestation, etc.) can be essential, but there is no point in overestimating human potential in comparison with the natural factors. But the anthropogenic effect could provoke climatic changes and cause a new cycle of warming.

Rise of temperature creates favorable conditions for disease development, which contribute not only to high temperature and humidity, but also to the expansion of habitat of animals hosting the disease (e.g. malaria).

Increased development of the microflora and lack of clean drinking water will foster the growth of infectious intestinal diseases. Rapid proliferation of microorganisms in the air may increase the incidence of asthma, allergies and various respiratory diseases.

In the future it is planned to pay much attention to greenhouse gas capture that emerge during electric power production and directly from the atmosphere in via plant disposal, use of oxygenic artificial trees and carbon dioxide injection to deep ocean depths, where it will dissolve in water columns.
COAL PRODUCTION CAUSES HEALTH PROBLEMS

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Coal, which formed after fossilized organic matter has been trapped in rock formations for many years, is Brown-black flammable substance. It consists mainly of carbon, hydrogen, oxygen and minerals. Coal is found in the common fossil fuel in the World. Although coal is mainly composed of carbon, coal dust which formed more than 50 substances and their oxide components, is a complex and heterogeneous mixture. The amount of minerals in the coal dust depends on the particle size of the powder and the coal seam. Coal dust consists mainly of kaolinite, illite, calcite, pyrite and quartz. Variety of environmental and health problems in burning or processing of fossil fuels — coal, oil, and gas. The problem is exceeded by human activities. Part of the dust is formed by the transformation of the ore and the side rocks into small particles because of the mechanical processes, and another part by the transfer of the dust into the furnace during the ventilation of the furnaces. Polluting particles in the air can cause problems in human. Additionally pollutants in the air can increase asthma symptoms. These dusts that form in the mines cause also pneumoconiosis disease which is important for the health of the workers. Pneumoconiosis is the lung disease caused by long-term respiration of dust suspended in the air. The size of the dust, the density in the environment and the quality of storage affect the disease. Besides the genetic structure of the body and the use of cigarettes are effective in the formation of the dust.

HARMFUL EFFECTS OF ASBESTOS

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Asbestos is a fibrous material that came from the silicates and naturally occurring in rock and soil. There are two types of asbestos which are chrysotiles and amphiboles. The former is worker organisms. It is a precursor of adaptation failure and a high degree of vulnerability to parasitism via cell death and oxidative damage.

The study was being conducted on the ore-dressing and processing enterprise in the course of three years (2013-2015). Total 471 mining workers had been examined, the composition group was 255 people. Physiological indicators of organism condition assessed by cardiohemodynamic parameters: heart rate variability (HRV) and tensio arterialis. Genome stability was evaluated on buccal cells and human lymphocytes of peripheral blood using micronucleus test.

The analysis of the organism functional state has been showed a working conditions complex impact on the organism functional state and the genome stability of the loparite mining workers.

THE INDUSTRIAL FACTORS IMPACT ON THE FUNCTIONAL STATE OF MINING WORKERS IN THE MURMANSK REGION

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Healthy lifestyle ensuring is a priority of sustainable development of human society. The working conditions are an important factor in shaping the health of working age. This is especially true for workers associated with harmful and dangerous working conditions.

The aim is the evaluation of the industrial factors impact on the organism functional state and the genome stability of the loparite mining workers. The study was being conducted on the ore-dressing and processing enterprise in the course of three years (2013-2015). Total 471 mining workers had been examined, the composition group was 255 people. Physiological indicators of organism condition assessed by cardiohemodynamic parameters: heart rate variability (HRV) and tensio arterialis. Genome instability was evaluated on buccal cells and human lymphocytes of peripheral blood using micronucleus test.

The analysis of the organism functional state has been showed a working conditions complex impact on the workers health. This is reflected in autonomic dysfunction of the HRV regulation. Dysfunction is expressed in the stress indices (SD) increasing in the earlier exhaustion of adaptive reserves, in the reducing of the vegetative level contribution in heart rate regulation by the autonomic nervous system. A significant contribution of the very low-frequency component (VLF) in the frequency range of HRV indicates a decline in the functional state of worker organisms. It is a precursor of adaptation failure and a high degree of vulnerability to the environmental factors effects. Mining workers are exposed to the most severely affected by industrial factors. Analysis of the health workers structure showed the prevalence of before disease status and pathological conditions regardless of gender. The distinct and significant growth of pathological conditions observed with age and service length.

The genome destabilization of the mining workers was shown apoptosis rate reducing and genes frequency reducing in buccal epithelium. The increase of the cytogenetic abnormalities frequency was noted in the buccal cells, including the frequency of cells with micronuclei, cell with proliferation disorders. The cell cycle time reduction and multi-core cell frequency increasing were detected on the lymphocytes cells culture. This constitutes a violation of the process of cytokinesis and proliferation rate of cells and therefore an increased cancer risk.

MOLECULAR, ISOTOPIC AND GENETIC COMPOSITION OF HUMAN GALLSTONES: A GEOMEDICAL STUDY

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Bacteria in the greater environment are seen to be responsible for a variety of concretions i.e. Stromatolites, oolites and calcium carbonate concretions. The structure and shape of their concretorial product is closely linked to the nutrients available in their immediate environment. Their environments can be ascertained by studying the molecular and isotopic structure of their fabricated products. It is believed that doing a similar study on human gallstones — as a possible by-product of bacterial metabolism, may yield similar information as to why gallstones form and the reason for their various morphologies/shapes. Long standing debates about the likelihood of both biogenic and non-biogenic processes in various environmental contexts where bacteriologic precipitation of the calcium oxalate matrix is well understood. We hope this novel approach will reveal clues to the mechanisms behind lithogenesis of gallstones in the human body.

BLOOD MERCURY LEVEL OF PEOPLE LIVING IN COASTAL AREAS

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The study was performed to evaluate the effects of residence in districts which included an tidal area, and those of recent seafood intake on human blood mercury level. Korean adults older than 19 years of age recruited by probability sampling methods stratified by sex and age from 102 sampling areas that cover all metropolitan, urban, rural districts in Republic of Korea. The study subjects were selected randomly (20 men, and 1194 women). Personal interview was performed with a structured questionnaire including questions about demographic characteristics, current address, and dietary habits. Concentration of total mercury in blood was determined using a thermal decomposition gold amalgamation atomic absorption spectrophotometer designed for direct mercury analysis. Blood mercury level was compared by the residence area (coastal area versus inland area) and by recent seafood intake. Geographic mean (geographic standard deviation) of total mercury concentration in whole blood was 3.87 (2.18) μg/L. Blood mercury level was different according to the geographical area of study subjects. The geometric mean of blood Hg level was higher in subjects who were residing in coastal areas (5.05 μg/L) than those who were in inland areas (3.82 μg/L). Subjects who ate seafood within 3 days prior to blood sampling (4.19 μg/L) showed a significantly higher blood Hg level than those who did not eat seafood (3.46 μg/L). The geometric mean of blood Hg level was the highest in coastal dweller with recent seafood intake (5.42 μg/L), and followed by coastal dweller without recent seafood intake (4.18 μg/L), inland dweller with recent seafood intake (3.97 μg/L), and inland dweller without recent seafood intake (3.56 μg/L). These results suggest that residing in coastal area and recent seafood intake might be independent determinants of blood Hg level.

TOXICITY STUDIES ON DEXTRAN STABILIZED IRON OXIDE NANOPARTICLES

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The surface functionalization of magnetite nanoparticles can introduce additional functionality, which can be successfully used widely in various fields of medicine and environmental applications. The spherical shape of the nanoparticles and uniform size with an average diameter around 9.5±0.5 for γ-Fe₂O₃ and DMNP was 17 nm and 21 nm respectively. Moreover, a non-invasive method based on ultrasounds was used to characterize the aqueous solutions. The ultrasonic
experiments at 5 MHz are capable to identify important characteristics of the tested suspensions, such as the velocity attenuation and the FEM model allows to simulate the effective wave propagation in the fluid with dispersed nanoparticles. The inverse problem tested in this case, has provided a series of pairs of elastic constants, from which the pair offering the best fit was extracted.  

One of the fundamental questions in biomedicine is how the health of not only human but also animal is affected by various factors, including aging. This is especially related to the climate change in the direction of warming. As a result of this phenomenon, we are facing the problem of microorganisms that have a unique enzymatic activity and unusual metabolism from permafrost (Gonzalez, Robb, 2000; Prokofeva et al., 2000). It is therefore important to know how the immune system and psyche react. Because the main function of these systems is organism protection (Sukhovey 2014, 2016), the purpose of the study is to determine the relationship of behavioral and immune responses in the experiment on introduction of microorganisms from the permafrost. Bacteria of the genus Bacillus from the permafrost were introduced to laboratory mice intraperitoneally. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19/06/03 “Rules of good laboratory practice in the Russian Federation” of humane treatment of laboratory animals are met. A system of symptoms was evaluated in the laboratory animals, the main symptoms being nephropathy suffers in the village of Miloševac. Concluding this research, the lizards will be analyzed for the purpose of determining the concentration of aristolochic acid in these sediments potentially leaking into the drinking water, is therefore required. Research so far suggests that the causes of Balkan endemic nephropathy are to be found in organic compounds in the drinking water. Continuing this research, the lizards will be analyzed for the purposes of determining the concentration of aristolochic acid in the poorly soluble substance it would be leaking into the ground water.

**SD-19**

**PSYCHO-IMMUNE ASPECTS OF ADAPTATION TO THE INJECTION OF MICROORGANISMS FROM PERMAFROST IN EXPERIMENT**  

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One of the fundamental questions in biomedicine is how the health of not only human but also animal is affected by various factors, including aging. This is especially related to the climate change in the direction of warming. As a result of this phenomenon, we are facing the problem of microorganisms that have a unique enzymatic activity and unusual metabolism from permafrost (Gonzalez, Robb, 2000; Prokofeva et al., 2000). It is therefore important to know how the immune system and psyche react. Because the main function of these systems is organism protection (Sukhovey 2014, 2016), the purpose of the study is to determine the relationship of behavioral and immune responses in the experiment on introduction of microorganisms from the permafrost. Bacteria of the genus Bacillus from the permafrost were introduced to laboratory mice intraperitoneally. The requirements of the Helsinki Declaration of the World Medical Association, the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (number 123, 1986), as well as the order of the Ministry of Health of the Russian Federation № 267 from 19/06/03 “Rules of good laboratory practice in the Russian Federation” of humane treatment of laboratory animals are met. A system of symptoms was evaluated in the laboratory animals, the main symptoms being nephropathy suffers in the village of Miloševac. Concluding this research, the lizards will be analyzed for the purposes of determining the concentration of aristolochic acid in these sediments potentially leaking into the drinking water, is therefore required. Research so far suggests that the causes of Balkan endemic nephropathy are to be found in organic compounds in the drinking water. Continuing this research, the lizards will be analyzed for the purposes of determining the concentration of aristolochic acid in the poorly soluble substance it would be leaking into the ground water.

**SD-21**

**HEALTH PROBLEMS RELATED TO INADEQUATE PUBLIC SUPPLY IN RURAL AREAS OF NORTHEASTERN BRAZIL**  

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Much has been known about the relationship between water and public health. Although not always easy to measure the positive impact produced by the water supply on the occurrence of gastro-intestinal problems and worms. Epidemiological studies have shown consistent results regarding the existence of that relationship. In Brazil, the diarrhoea is the leading disease related to inadequate public supply. For the studies case was conducted the impact Diagnosis of the conventional systems implantation in rural villages in the municipalities of Arcoverde and Sertânia, benefited by the Arcorvede Adductor System, and in the rural localities of the municipalities Afânio and Dormentes, benefited by the system Adductor Afânio / Dormentes. The rural localities selected were the villages of Mulhada, Umburanas, Cruzeiro do Nordeste, Moderna, Cavita, Roça Nova and Realém. One fact to consider is that in rural areas considered, until the deployment of systems, there was no distribution networks of water or wastewater treatment, where public health sanitation related showed the fragility. For the period previous to regular supplies, it was verified high incidence of dysentery and worms in children. For the later period, there has been a real reduction in numbers of cases of infantile diarrhoea in locations benefited by systems. It is observed that the largest decrease occurred in the locality where the water distribution is made directly into the homes, due to the possibility of greater hygiene and no water contamination in collection and transportation.

**SD-22**

**WATER – STONE – MAN** CONCEPTUAL MODEL OF A BALANCED HEALTH PROBLEMS RELATED TO INADEQUATE PUBLIC SUPPLY BY V.L. VERNAKOV

V.L. Vernakov

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V.I. Vernakov attached great importance to water in the processes of mass transfer of substance and energy transport in the form of various physical fields which is concentrated in his world known ‘water-stone-gas-living’ balance system. The present article focuses on the influences of narsile underground drinking water used in everyday life on human health, i.e. hydrogeological aspects of medical geography. For the studies case was conducted the impact Diagnosis of the conventional systems implantation in rural villages in the municipalities of Arcoverde and Sertânia, benefited by the Arcorvede Adductor System, and in the rural localities of the municipalities Afânio and Dormentes, benefited by the system Adductor Afânio / Dormentes. The rural localities selected were the villages of Mulhada, Umburanas, Cruzeiro do Nordeste, Moderna, Cavita, Roça Nova and Realém. One fact to consider is that in rural areas considered, until the deployment of systems, there was no distribution networks of water or wastewater treatment, where public health sanitation related showed the fragility. For the period previous to regular supplies, it was verified high incidence of dysentery and worms in children. For the later period, there has been a real reduction in numbers of cases of infantile diarrhoea in locations benefited by systems. It is observed that the largest decrease occurred in the locality where the water distribution is made directly into the homes, due to the possibility of greater hygiene and no water contamination in collection and transportation.

The major source of water on the territory of West-Siberian Megabasin is Altai-Nowomužiok hydrogeological complex. Its technogenic affect is global and permanent. The complex is located in the area where hydrocarbons are extracted with related processes such as water pumping into the terrastatic pressure support system, bottom water waste management etc. Besides this territory is urbanized and residential. Comparative characteristics of chemical composition of drinking water on the territory of Yamal-Nenets, Khanty-Mansiysk autonomous regions and Tyumen were published earlier in the paper [2]. They show the difference in deviations from the standard. If we draw parallels with the data of diseases in the areas in question, the highest number of patients with anemia per 100 000 of the population has been registered in Yamal-Nenets autonomous region (636,1), as well as patients with kidney diseases (53,6) [5]. The highest number of subcutaneous tissue problems by a slight margin were registered in Khanty-Mansiysk autonomous region (636,1), as well as patients with kidney diseases (53,6) [5]. Tyumen takes the second place in anemia patients (429,4) [5]. At the moment direct relation has been shown between a higher level of manganese and the growth of bone and muscle diseases as well as urgenital problems (the highest number of patients with urgenital...
Relatively high content of fluoride are found in many thermal and mineral water fields connected with fault disturbances. The maximum concentrations in the country are registered in vicinity of the town of Kazanlak (the thermal water field “Ovoshtnik” – 23–24 mg/l). Origin of fluoride of this area is due to the high possibility of F-leaching at high temperatures and pH from various fluoride minerals. Mineral water was used as drinking one by the local people in this area until there was no any central water supply that caused distribution of fluorosis among many people there. Now, this issue has been solved. Another problem is the bottling of mineral water with fluoride content more than 1.5 mg/l and its distribution on state markets. High concentration of fluoride in groundwater is observed in some aquifers in Northern Bulgaria but due to their high TDS they are not used at all for drinking purposes.

Arsenic is a metalloid with an average concentration of 2 ppm and a density of approximately 5.8 g/cm³ in the ground crust. More than 200 mineral compounds contain arsenic as a component. It constitutes about 0.0005% of the earth. It is the 20th most common element on earth, the 14th in sea water and the 12th in human body. Arsenic naturally occurring with geothermal, volcanic activities and weathering of rocks. Besides, it occurs because of anthropogenic and biological sources in nature. In this way, consumption of drinking water which is contaminated and the use of arsenic-contaminated aquifers for irrigation poses a risk to the agricultural environment and food chain. The World Health Organization (WHO) has determined that the maximum arsenic content in drinking water is 10 μg/l. And that the water containing arsenic above this value is toxic. It has also been classified by the International Agency for Research on Cancer (IARC) as group 1 carcinogen. Arsenic exposure causes significant skin lesions like melanosis, keratosis and pigmentation, causing cancer and genetic material damage, cardiovascular disorders, respiratory, excretion, circulatory, endocrine and immune system diseases.

Arsenic is not a natural water contaminant. Arsenic contamination of water is due to anthropogenic activities. Historically, the majority of As contamination of drinking water was caused by deforestation and burning of arsenic-rich wood. Arsenic is widely used as a chemical agent in various products. The large-scale use of arsenic as a pesticide, fungicide, wood preservative and agricultural soil conditioner is the most significant pollution source for the environment. Arsenic contamination is most widespread in developing countries, particularly in South-East Asia and Africa. Arsenic is also associated with air pollution and is found in the flue gases of power plants. Arsenic is a settling gas transported by wind and water. Arsenic is able to travel great distances and accumulate in groundwater, lake and river sediments, and soil. Arsenic contamination of water is due to anthropogenic activities. Historically, the majority of As contamination of drinking water was caused by deforestation and burning of arsenic-rich wood. Arsenic is widely used as a chemical agent in various products. The large-scale use of arsenic as a pesticide, fungicide, wood preservative and agricultural soil conditioner is the most significant pollution source for the environment. Arsenic contamination is most widespread in developing countries, particularly in South-East Asia and Africa. Arsenic is also associated with air pollution and is found in the flue gases of power plants. Arsenic is a settling gas transported by wind and water. Arsenic is able to travel great distances and accumulate in groundwater, lake and river sediments, and soil.

The goal of this research was to determine and optimize the reactivity of geo-engineered particles of magnetic (Fe₃O₄) with potential applications in environmental remediation of trace elements (TE). The Fe₃O₄ nanoparticles were synthesized by co-precipitation of Fe³⁺ and Fe²⁺ ions at room temperature in controlled atmosphere. The obtained materials were investigated by transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, Raman spectroscopy, Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray analysis (EDAX). The calculations of the average particle size of Fe₃O₄ samples before the adsorption of As³⁺ and Cu²⁺ ions were compared with the BET surface area and average pore size of the Fe₃O₄ nanoparticles were 100.5179 m²/g and 24.3979 nm. The adsorption of As³⁺ and Cu²⁺ ions indicated that the dimensions of the particles Fe₃O₄ decreased after the adsorption of As³⁺ and Cu²⁺ ions. The BET surface area and average pore size of the Fe₃O₄ nanoparticles were 100.5179 m²/g and 24.3979 nm. The adsorption of As³⁺ and Cu²⁺ ions were compared with the BET surface area and average pore size of the Fe₃O₄ nanoparticles.
The benefits of shungite ores usage are: high organic contaminants sorption capacity, such as oil products, phenols, fatty high molecular weight acids, spirits and others. The oil-products collection effectiveness reaches 99%, phenols and low concentration solutions collection effectiveness reaches 90%. Type III shungite sorbent was tested for neutralization of liquid technological wastes, containing highly toxic rocket fuel - 1,1-dimethylhydrazine. Positive results were obtained. Shungite can be regenerated by a steam-gas activation at the temperatures of 300-800°C or by the annealing in air at 400-800°C. Chemical and electrochemical regeneration are possible. Thus, on the basis of complex study of physical and chemical parameters, structure and mineral composition, it is shown that shungite ores are a sorption material, applicable to the purification of waste water and contaminated soil from the oil-products and other organic pollutants.

Arsenic may affect the function of proximal convoluted tubules and glomeruli, but epidemiological data limit our knowledge about its role in risk assessment. We conducted a national cohort study in Taiwan, where the prevalence of end-stage renal disease (ESRD) is among the highest in the world, to evaluate the associations between exposure to arsenic in drinking water and the occurrence of chronic kidney disease (CKD) and its progression to ESRD. Using data extracted from the Longitudinal Health Insurance Database of the National Health Insurance in Taiwan, we constructed a cohort with a median follow-up of 23 years. The cohort included 2,845,028 participants. Using a nested case-control study, we identified 1,680 incident cases of ESRD and 2,154,049 controls. We found a positive association between arsenic exposure and CKD, ESRD, and its progression, with a hazard ratio (HR) of 1.10 (95% confidence interval [CI]: 1.08-1.12) for CKD and an HR of 1.07 (95%CI: 1.01-1.14) for ESRD. We have also identified the endemic areas of arsenic exposure and constructed maps of arsenic levels using the geographic information system. We concluded that a high arsenic level in the drinking water was a risk factor for developing CKD and ESRD, independent of most documented risk factors. Intervention programs should be implemented in endemic areas of exposure to reduce the risks.

Concentrations of fluoride in earth materials (rocks, soils and water) are varied. These variations are due to certain factors such as presence of fluorite minerals in rocks, soil and water (pH, residence time, water type, climatic conditions and depth). Concentration of fluoride in rocks in parts of northern Nigeria (parts of northeast) in migmatite ranges from 500 to 1100 ppm, 606 to 2500 ppm for coarse porphyritic hornblende biotite granite, granodiorite, 500 ppm and the Cretaceous Bima Formation 62 and 79ppm. Fluorine in soil samples ranges from 146 to 555ppm. In the northeast areas; migmatite, 25 to 380ppm, coarse porphyritic hornblende biotite granite, 79ppm, trachyte, 949ppm, riebeckite granite (Langtang Area), 800 and 1000ppm, pH and in water (pH, residence time, water type, climatic conditions and depth). Concentration of fluoride in water in all areas with high fluoride content in rocks, except the Jos Bukaflite Biotite Granite 914 and 6231ppm, Dibil Biotite Granite, 2587ppm and quartz – pyroxene – fayalite porphyry, 1280ppm. Fluorine in soils of the Younger Granite Province ranges from 155 to 599ppm from 0 to 40m depth in two locations. High fluoride (≥15mg/l) WHO Upper Limit were recorded in drinking water in all areas with high fluoride content in rocks, except the Jos Bukaflite Younger Granite areas which have over 80% of water points with fluoride lower than 0.5mg/l WHO Lower Limit. Fluorite in hornblende in granites and migmatite are the minerals hosting fluoride. Inhabitants of areas with high fluoride in groundwater show clear manifestation of dental fluorosis.

In this study, ten surface watersamples from Yagdan Creek (Nigde, Turkey) were collected and analyzed for metals (Cr, Ni, Cu, Cd, Pb, Zn) to assess the level of contamination [1, 2]. In order to get this, heavy metal pollution index (HPI), correlation among elements, factor and cluster analyses and were calculated.
AQUOUS BIPHASIC SEPARATION OF THALLIUM FROM AQUEOUS SOLUTION USING PROPA-NOL AND SALTS

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The aqueous biphase system has a great potential to separate metal ions (such as gold and zinc) from aqueous solutions due to its non-toxicity and cost-effectiveness. However, few studies on the separation of thallium (Tl) using aqueous two-phase systems have been reported. In this study, extraction and separation of Tl from aqueous solution using a new aqueous biphase system consisting of propanol and salts were investigated. The extraction of Tl was driven by the complexation between Tl-chloro-complex (TlCl₂⁻) and the protonated oxygen atom from propa-nol. The addition of appropriate amount of salt helps form the aqueous two-phase stratification, in which Tl and propanol were enriched in the upper phase while the most water and salt were separated in the bottom phase. Over 99% of Tl(III) can be extracted under the extracting system tested. This extraction method works perfectly on Tl(III) but poorly on Tl(I), which implies that this methodology not only could be an effective means to recover Tl from wastewater but also be a good alternative to the analysis of Tl specification in aqueous solution.

ISOTOPIC AND RACE ELEMENT CONSTRAINTS ON THE ORIGIN AND EVOLUTION OF SALINE GROUND WATERS IN CONFINED AQUIFER SYSTEMS OF YUNCHENG BASIN, NORTHERN CHINA

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A combination of major, trace elements and 87Sr/86Sr values is used to examine the origin and evolution of saline ground water in confined aquifer systems in the Yuncheng Basin, northern China. The ground waters are characterized by distinctly lower 87Sr/86Sr and 87Sr/86Sr values. This depletion indicates a decrease from Tl-chloro-complex (TlCl₂⁻) and the protonated oxygen atom from propa-nol. The addition of appropriate amount of salt helps form the aqueous two-phase stratification, in which Tl and propanol were enriched in the upper phase while the most water and salt were separated in the bottom phase. Over 99% of Tl(III) can be extracted under the extracting system tested. This extraction method works perfectly on Tl(III) but poorly on Tl(I), which implies that this methodology not only could be an effective means to recover Tl from wastewater but also be a good alternative to the analysis of Tl specification in aqueous solution.

CONTENTS OF ESSENTIAL MACRO-ELEMENTS IN HAIR AND NAILS OF RESIDENTS IN THE KRUPINA DISTRICT, SLOVAK REPUBLIC

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This paper deals with the analysis of Ca, Mg, Na, K and Si contents in hair and nails of residents living in the Krupina district, Slovak Republic. Studies area is located in geol- ogical environment of volcanic rocks (mainly andesites and their pyroclastics) releasing into the other compounds of the environment, mainly groundwater/drink water and soils, low contents of Ca and Mg on the one hand and increased contents of Na and K as well as very high Si contents on the other hand. Neogene volcanic rocks were across the Slovak territory identified as the most unfavourable geological environment with documented negative effects on resident population. In study area (Krupina district) with resident population supplied within public supply system with soft drinking water (Ca <25 mg/l, Mg <10 mg/l) mainly increased mortality from cardiovascular diseases but also e.g. oncological diseases was documented compared to Slovak average soft water deficient in Ca and Mg contents. This study aimed to analyse reflection of such unfavourable geological environment in contents of selected essential elements including Ca and Mg in biological materials of residents. Biological monitoring was performed in a sample of 111 respondents (48 adults, 63 children). Total number of 91 hair samples and 61 nail samples was collected and analysed. Median values of evaluated essential elements were determined in hair in levels: Ca 164 mg/kg, Mg 81 mg/kg, Na 281 mg/kg, K 127 mg/kg, Si 50 mg/kg, and in nails in levels: Ca 1 449 mg/kg, Mg 198 mg/kg, Na 1 115 mg/kg, K 1 027 mg/kg and Si 176 mg/kg. Generally all of evaluated elements showed high variability and high variance of concentration levels. Their contents in nails were markedly higher (about 2-5 times) than in hair. We did not document any significant differences in nail concentration levels between genders while in case of hair significantly higher contents mainly of Ca and Mg were observed for women.

Acknowledgments. This research has been performed within the project Life for Krupi-na (LIFE12 ENV/SK/000094) which is financially supported by the EU’s funding instrument for the environment Life+ programme and Ministry of the Environment of the Slovak Republic.

CURATIVE WATER IN KARELIA

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Karelia is the part of the Baltic region of the ferruginous and radon waters formed in the crystalline rocks of the Fennoscandia Shield. Reserves of the mineral waters are estimated and used for therapeutic purposes in only two fields – “Martial Waters” (iron) and “Kondokskoe” (radon). The first Russian resort “Martial Waters” with the direct participation of Peter the Great in 1719 marked the beginning of resort business in Russia. Name of the resort was given in honor of the god of war Mars. In the Peter the Great’s time only springs existed there. Currently there are 4 artesian wells. Known reserves of mineral water is 15 cubic meters per day. In its modern form, the resort operates since 1964 and is used for medical purposes and drinking fresh ferruginous water. This is bicarbonate-sulfate-calcium-magnesium groundwater with a high content of an iron up to 140 milligrams per liter.

Another type of mineral water in Karelia is radon water. The field of the mineral water “Kondokskoe” is located in the northern Karelia. A spring with highly radioactive water was discovered in 1977 during exploration work on the iron ore deposit Kostomuksha. Groundwater is confined to the upper part of the Archaean metamorphic rocks and drained by springs in the area that has the tectonic contact with granites, migmatites and sedimentary-volcanic rocks. The spring water is cold, very fresh, with the average radon concentration of 4200 Bk/l. The high Sr contents in groundwater/drinking water (“water hardness”) used for public supply of residents vary in higher arterial age of respondents supplied by the soft drinking water in comparison with in higher arterial age of respondents supplied by the soft drinking water in comparison with
PULMONARY TOXICITY OF PARTICULATE MATTER DERIVED FROM DUST SAMPLES FROM DZHIDA MINE (TRANSBAIKALIA): PRELIMINARY RESULTS

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Inhalation of mineral contaminants can have highly detrimental effects on human health. A large body of scientific literature describes associations between short-term and long-term exposures to anthropogenic particulate matter and increased mortality and hospitalization from cardiovascular and respiratory diseases, based on epidemiologic studies of human exposure to PM with aerodynamic diameters ≤ 10 microm (PM₁₀) [1].

In the present report, a preliminary hazard identification study of the toxicity of PM derived from dust at the area of the Dzhida tungsten-molybdenum mining-concentrating complex, located near Zakamensk town in Buryatia Republic (Russia), is considered. Molybdenite and sulfide-hubnerite ore wastes up to 40M tons in total have been accumulated in this place. Five pooled samples were examined. Three of them were the solid fraction of snow samples taken near the waste dam. Two samples contained home dust from attics. To study the fraction used to 0.074 mm, weight of sample about 2 g.

Two samples were microbiologically analysed, before and after being submitted to sterilization. Mice were euthanized 24 hours after aspiration and lung inflammation and injury were assessed, along with systemic vascular endothelial dysfunction. Bulk elemental and trace metals analysis of the initial samples and bulk elemental analysis of PM₁₀ fraction made by ICP-OES, while trace metals analysis of PM₁₀ made by ICP-MS.

Administration of the PM₁₀ fraction samples taken near the tailings had a significantly greater impact on inflammatory processes in the lungs and vascular constriction of experimental mice than inhalation of house and attic dust. All five samples exhibited greater pulmonary toxicity than the background dust PM₁₀. The concentration of metals in respirable fraction of dust is two to three orders of magnitude higher than in the original sample. ICP-MS analysis suggests that lead (Pb) and cadmium (Cd) may be a specific concern. All data presented here are preliminary until a complete quality control check has been performed.

Acknowledgements. Authors are thankful to Paul W. Robinson Research Director of Southwest Research and Information Center, NM USA for support this study.

This work has been supported RFBR (grant N 16-05-01041)

APPRAISAL OF MICROBIOLOGICAL SAFETY OF NATURAL PELIODS

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Microbiological control for sanitary safety, particularly of pathogenic microorganisms, is essential along the processes of preparation, storage, topical application and reuse of both natural peloids and peloid s.s (stricto sensu) or just peloid (Gomes et al., 2013). Obviously, natural peloids with origin in sedimentary or in volcanic deposits, due to their exposure and to the possibility of bearing significant contents of organic matter, are more susceptible to microbiological contamination comparatively to peloid s.s (those called designed and engineered peloids, a particular type of extemporaneous peloids), that could be produced in controlled chemical and microbiological conditions (Gomes et al., 2015).

Dermal absorption is the natural pathway for microbial infection, hence the skin areas potentially susceptible to microbiological contamination comparatively to other areas, such as entrance doors, and through a Next Generation Impactor (NGI) in the laboratory. The study has identified respirable fraction (PM₁₀), amounting to about 1% of the initial sample, by mass. Pulmonary toxicity of each sample was studied in mice. 100 μg of respirable dust in 50 μl of vehicle were delivered by pharyngeal aspiration. Saline (Sanal) was a dispersion media (DM), containing mouse albumin and a phosphotydicholine to reduce particle agglomeration. Also included was a “background dust” control from the Arizona, USA region, which contained predominantly crustal elements. Mice were euthanized 24 hours after aspiration and lung inflammation and injury were assessed, along with systemic vascular endothelial dysfunction. Bulk elemental and trace metals analysis of the initial samples and bulk elemental analysis of PM₁₀ fraction made by ICP-OES, while trace metals analysis of PM₁₀ made by ICP-MS.

All data presented here are preliminary until a complete quality control check has been done on the data.

ACKNOWLEDGEMENTS. Authors are thankful to Paul W. Robinson Research Director of Southwest Research and Information Center, NM USA for support this study.

This work has been supported RFBR (grant N 16-05-01041)
The analysis shows that in general the geophysical situation in the Moscow region is disturbed. The tendency to increasing in geomagnetic activity over time is established. Repeatability of geomagnetic disturbances is characterized by clearly pronounced periodicity with characteristic periods of about 14, 27, 60, 182 and 365 days.

**SD-43**

**THE EFFECTS OF AIR POLLUTANT CHANGE ON RESPIRATORY DISEASE DURING DUST STORM DAYS IN TAIPEI CITY, TAIWAN**

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**Background/Aim.** Long-range transport of dust particles in the atmosphere has been recognized as having direct and indirect effects on health. We conducted an epidemiology study to evaluate the associations between acute exposures to air pollutants and respiratory diseases during the dust storm periods, taking into account the possible lags in their effects.

**Methods.** We retrieved daily records of outpatient department (OPD) visits from a random sample of one million people in the National Health Insurance Research Database of Taiwan and included records on OPD visits for respiratory infection (ICD-9 codes 460 to 519) from 2005 to 2010. Data on air pollutants were obtained from the air quality monitoring stations established in Taipei City by the Environmental Protection Administration. Air pollutant data included PM_{10}, carbon monoxide (CO), ozone (O_3), nitrogen oxide (NO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). We adopted a case crossover design to evaluate and describe the effects of air pollutants on respiratory infection. The lag days of the effects were taken into account in the data analyses.

**Results.** The PM_{10} concentrations during dust storms were significantly higher than those in the 2-day period immediately ahead of the dust storms. We found that the risk of OPD visits for respiratory infection had significant associations with, O_3, PM_{10}, NO_2, SO_2, PM_{2.5}, during the dust storms days in Taipei. Levels of CO, NO_2, SO_2, PM_{10}, PM_{2.5} on OPD visits for respiratory infection with different lags in Taipei, Taiwan.

**Conclusions.** This case-crossover study provides evidence supporting the effects of CO, NO, NO_2, were negative associated with OPD visits for respiratory infection. When the lagged effects are considered, O_3 was negatively associated with OPD visits for respiratory infection.

**SD-44**

**INDOOR RADON EXPOSURE IN HIGH RADIOACTIVITY REGIONS AND PUBLIC HEALTH**

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Prolonged exposure to radon gas, the radioactive daughter of naturally occurring radium-226 of uranium decay series, has been demonstrated to be harmful to human health and the World Health Organization (WHO) has classified radon as a carcinogenic element. Many regions around the world do have geological settings with elevated levels of uranium and thorium and especially there, the radon concentrations inside buildings may build up attaining harmful concentrations from the radiation point of view. Analyses of radon were carried out in public buildings and private dwellings in granite uranium bearing regions and compared with radon levels in other geological settings of Portugal. Average radon concentrations were low in sedimentary regions in the south of the country, around 10 Bq/m^3, but attained average values of 600 Bq/m^3 and even up to 12 000 Bq/m^3 in a few cases in the granite regions of the North of Portugal, especially in uranium bearing regions. The exposure to these high radon concentrations is assessed in the light of WHO recommendations and of European Union Basic Safety Standards (EU Directive 2013/59). The need for corrective measures and for an action plan to lessen the exposure of the population to indoor radon in high radioactivity areas is discussed.

**SD-45**

**SITUATION ANALYSIS OF CUTANEOUS LEISHMANIASIS IN AN ENDEMIC AREA, SOUTH OF IRAN**

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**Objective.** To update current situation of the cutaneous leishmaniasis (CL) in Kazerun County, southwest of Iran and to analyse the epidemiological aspects of the disease during 2005-2015.

**Methods.** Data on CL were obtained from the Health Center of Kazerun County, and then analysed and mapped using SPSS and ArcGIS 10.3.

Results. A total of 700 cases of CL were recorded during the study period with an overall decreasing trend from 2005 to 2015. More than 60% of the patients were inhabitants of rural areas and males were infected more than females. Although there was not a significant difference between gender, job categories, residence and CL infection (P > 0.05), and age groups were significantly different (P < 0.05). But there was no significant correlation between monthly cases of the disease with average temperature (P > 0.05). Most of the acute lesions were found to be present on the hand, leg and face, respectively. The average CL incidence in the study area was calculated as 24.9/100000 population. A hot spot for the disease was found in southern part of the area (P < 0.05).

**Conclusions.** This study revealed that CL is present in Kazerun country. Thus, effective monitoring and sustained surveillance system is crucial in counteracting the disease, and it is possible, to eliminate it.

**SD-46**

**CLIMATE CHANGE AND THE DISTRIBUTION OF MALARIA VECTORS DURING THE PAST 5 DECADES IN IRAN: A SPATIAL ANALYSIS**

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Background Global warming and climate change affect various aspects of mankind, including public health. Anopheles mosquitoes are of Public Health importance and can be affected by global warming and other environmental variables. Here, we studied the distribution of Anophelus vectors of malaria in relation to environmental variables in Iran. Methods Long-term meteorological and entomological data of about 50 years in retrospect were collected and arranged in a geo-database and analyzed using ArcGIS ver. 9.3 and exported to SPSS ver. 20 for statistical analysis. Results Distribution maps have been updated for seven species of Anophelines vectors of malaria which involved Anopheles culicifacies s.l., An. flavitarsis s.l., An. stephensi, An. dhalii, An. sacharovi, An. maculipennis s.l. and An. superpictus in Iran. Distribution maps of vectors were made based on district areas using kriging model. Historical and recent records were demonstrated for each Anopheles based on climate factors in the distribution areas of each Anopheles vectors. Discussion Iran, like other parts of the world is facing with warming and this probably affected the distribution of Anopheles vectors. Despite the warming phenomenon, the country’s climate had changed during the cold season as temperatures became colder or cooler. This study shows that some vectors had migrated from the central part of Iran with dry and sunny landscape, moved towards the mountainous areas of the north or the warm and humid areas of the south. Historical records show that these anophelines have previously been distributed in lowland areas. If this process continues in the future, Anopheles mosquitoes may be seen in low lands with cold areas in central and northern parts of the country or will occupy humid and warm climates in the southern parts of the country where water is more available.

Figure caption - Current distribution compared with historical distribution and predicted distribution of An. culicifacies s.l and An. maculipennis s.l.; A. distribution and predicted distribution of An. culicifacies s.l in Iran, B. population fluctuations of An. culicifacies s.l in South-East part of Iran, C. distribution and predicted niche of An. maculipennis s.l. iniran, D. changes in the distribution of An. maculipennis s.l during the past 50 years.

**SD-47**

**CHARACTERIZATION AND BENEFIT OF PORTUGUESE GYPUSIMS AS RAW MATERIALS FOR DERMOCOSMETICS**

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**Objective.** To update current situation of the cutaneous leishmaniasis (CL) in Kazerun County, southwest of Iran and to analyse the epidemiological aspects of the disease during 2005-2015.

**Methods.** Data on CL were obtained from the Health Center of Kazerun County, and then analysed and mapped using SPSS and ArcGIS 10.3.

Results. A total of 700 cases of CL were recorded during the study period with an overall decreasing trend from 2005 to 2015. More than 60% of the patients were inhabitants of rural areas and males were infected more than females. Although there was not a significant difference between gender, job categories, residence and CL infection (P > 0.05), and age groups were significantly different (P < 0.05). But there was no significant correlation between monthly cases of the disease with average temperature (P > 0.05). Most of the acute lesions were found to be present on the hand, leg and face, respectively. The average CL incidence in the study area was calculated as 24.9/100000 population. A hot spot for the disease was found in southern part of the area (P < 0.05).

**Conclusions.** This study revealed that CL is present in Kazerun country. Thus, effective monitoring and sustained surveillance system is crucial in counteracting the disease, and it is possible, to eliminate it.
Gypsum deposits exploited for cement company CIMPOR in Loulé, Óbidos and Soure, were submitted to chemical, mineralogical, and technological characterizations, with particular emphasis in the recommended ones for the evaluation of the quality degrees needed for application in dermocosmetics. The studied deposits correspond to outcrops of small dimensions, in diapiric anticlines areas. In rule, these present gyposites of white colors, generally of higher quality for the traditional applications (as white cementing agent, generally adequate for cements and mortars. Several analyses were carried out, namely, grain size distribution (wet sewing and sedigraph), mineralogical-chemical composition (X-ray diffraction), geochemical (major and minor elements) analyses (X-ray fluorescence), abrasiveness, plasticity, texturometric (adhesivity and firmness), oil absorption and cooling rate. The results obtained so far point to Óbidos gypsum as the one showing greater mineralogical and chemical quality (almost pure gypsum/calcium sulphate), besides also being the finer (-63 μm) one, whereas Loulé and Soure present some mineralogical impurities (mainly quartz). Stated gypsums show, in general, good characteristics for application in dermocosmetics, namely in what concerns properties such as absorption, plasticity, adhesivity, firmness and abrasiveness. This last one presents, however, some limitations, in the cases of Loulé and Soure, with higher values (due to quartz presence). Thus, they need to be submitted to beneficiation to allow its application in products supporting, or even taking advantage, of relatively higher abrasiveness. For this, grain size separation (to obtain finer fractions) and density separation (to reduce quartz content) were performed.

SD-48 WHAT DOES GEOCHEMICAL COMPOSITION OF CHILDREN’S HAIR REFLECT MORE: GENDER PECULIARITIES OR ENVIRONMENTAL EXPOSURE? Ricardas Taraškevičius1,2, Rimantė Zinkūtė1, Laura Gedminienė2, Žilvinas Stankevičius3, Regina Morkūnaitė1
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The research is based on analysis of the total contents of Al, As, Br, Ca, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Rh, Se, Si, Sr, Ti, V, Zn (EDXRF) in the hair of 47 girls and 63 boys from Vilnius kindergartens and 7 of them (Cr, Cu, Mn, Ni, Pb, V and Zn) determined by AAS in snow-cover dust. Detailed study of correlation of 7 mentioned elements both in snow-cover dust and in hair is given by Taraškevičius et al. (2017): DOI: 10.1007/s10653-017-9977-7. The correlation of the contents of Cr, Ni and V in dust with respective contents in hair was more significant for boys (p<0.001) than for girls. Only for Pb, the correlation had similar strength for both genders (p<0.01). The hair of girls is inclined to accumulate higher contents of Ca, Cu, Mg, Mn, Ni, Si, Sn and Zn (3.0, 1.1, 1.7, 1.9, 1.3, 1.2, 2.6, 1.2 times, respectively) than boys, the differences are significant at p<0.01. The hair of boys has higher content of other elements: 2 times higher of Br and Cr, 1.6 times of K, 1.1 times of P (p<0.01) and 1.2 times of Na (p<0.05). Review of gender influence on the differences in hair elemental composition is also done. Our observations suggest that when using the results of kindergarten children’s hair analysis for various aims (e.g. for recommending the nutritional supplement) both the gender and the environmental conditions of the residences must be taken into account.

SD-49 HEMOGLOBIN BLOOD – INDICATOR OF A HUMAN’S LONG-TERM ADAPTATION TO THE ENVIRONMENT GEOPHYSICAL PARAMETERS Taumanova G.E.
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We draw our attention to the general geological history of some regions of our planet and the surprising similarity of the health indicators of the long-lived population of these regions. A human being and other living beings are generators of physical fields that interact with geophysical fields – magnetic, gravitational, seismic, etc. The hemoglobin level (Hb) in blood is a universal nonspecific indicator of adaptation processes, processes of the body’s tension on various external influences. The human hemoglobin is a metalloprotein molecule, which has a large magnetic moment, because the Hb molecule contains from 62 to 70 percent of the total body iron. It is known that the modern Mediterranean, Black and Caspian Seas are relics of the Tethys Ocean and have a common geological history. It is also known that among the peoples settling the coasts of the Mediterranean and Black Seas – Southern Europe and North Africa, various forms of hemoglobinopathies, in particular thalassemia, are common. A similar pattern of blood can be found among the population living in lowland areas of Azerbaijan and Dagestan. The identical blood picture was found in Kazakhstan – among the population of the Caspian Lowland. The characteristic feature of the blood picture here is the low level of Hb (from 73.6% to 95% in different years) sometimes reaching critical numbers of 53 g/l (normal 110-140 g/l / 1) with a ferritin index (the main iron reserve in the body), the presence of a significant number of target red blood cells (up to 14% in the field of view in 47% of the examined people), which normally do not exceed 1% and never increase with iron deficiency anemia, which, apparently by mistake, is considered to be one of the most common diseases in this region.
regional health. On the basis of the sociological survey it was concluded that the oil factor significantly affects population health, especially diseases related to the lungs and stomach. These issues were evident in the Kaliningrad region, even if it was a so-called “background” region and not the main one as Tyumen region, where these features were revealed most clearly.

We concluded that the increasing anthropogenic and technogenic impact on the environment are particularly noticeable in these two regions of the Russian Federation. This research on environmental safety aims to assist officials with developing a better policy at the federal and regional level.

SD-52 DUST POLLUTION IN THE VICINITY OF PEROCHIMICAL PLANT: CASE STUDY OF PAVLODAR (REPUBLIC OF KAZAKHSTAN)

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Air pollution is an important medical and ecological issue for many cities in the world. One of the most significant indicators of air quality is the content of fine dust aerosols in it. For this reason it is necessary not only to have the information on the content of chemical elements in the atmosphere, but also to know modes of their occurrence and the particles sizes. Solid particles with the size of less than 10–25 µm are the most hazardous for the human health, causing the respiratory diseases, and by the weakened immune system – early death [1].

It should focus attention on the dust condition of atmospheric air in the industrial areas and settlements with industrial enterprises impact.

With the purpose to estimate the air pollution level and diseases increased risk, we have collected snow samples in the vicinity of Pavlodar petrochemical plant and in the village Pavlodarskoye (population 6230 persons), located 3 km far from the plant. 22 samples were collected. We study snow solid phase. The character of technogenic impact was assessed through the daily dust load on investigated areas. The samples were analyzed using scanning electron microscopy.

The value of dust load varies from 40 to 306 mg/m2 a day, and in the village Pavlodarskoye in the limits of 30-443 mg/m2 a day. With distance from the plant, north-eastwards, dust load amount increases at a distance of 2.5 km and equaled 306 mg/m2 a day. The average pollution level was determined through estimated maximal dust load value, which corresponds to moderately hazardous level of dust rate of population according to [2]. Also, mineral and non-mineral phases of the samples were determined. It was identified, that some particles in the insoluble fraction of aerosol in snow with the size of 0.5-25 µm can get into human organism by inhalation.

SD-53 NATURAL OCCURRENCE OF POTENTIALLY HARMFUL FLUORIDE CONTENT IN GROUNDWATER: AN EXAMPLE FROM NAKURU COUNTY, THE KENYAN RIFT VALLEY

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High fluoride concentrations have been known to have several health implications on humans and animals health. The present study deals with the occurrence and distribution of fluoride in different aquifer systems of Nakuru County, Kenya. Rift Valley Water-quality data from 32 boreholes and hydro-geological data were acquired from the Catholic Diocese of Nakuru-Water program and from literature respectively. Results show a dominant Na-HCO₃ and a slight Na-HCO₃-CI water type dominated by sodium, fluoride, chloride, sulphate and bicarbonate. More than 87% of the boreholes show fluoride levels higher than the limit recommended by World Health Organization for safe drinking water. Fluoride levels ranged from 0.5-72 mg/l with a mean of 11.08 mg/l and showed a strong positive correlation with the dominant parameters and a negative correlation with calcium, borehole depth, and water hardness. The correlations suggest that, minerals dissolution and evaporative enrichment might be the main processes of fluoride release and concentration in groundwater. Spatial analysis showed that, fluoride concentrations were not confined to the type of aquifers, but rather to their locations. Low fluoride aquifers were located close to the rift’s Bathai and Mab escarpments, while high fluoride aquifers were in the rift floor, where the fluoride hotspot was located. Dilution of groundwater by high rainfall and little water-rock reaction time in the escarpment recharge zones leads to low fluoride concentrations. Accumulation of dissolved solutes in the rift floor aquifers as groundwater flows from the escarpments, and evaporative enrichments from high temperature leads to high fluoride concentrations.

SD-54 GEOPHAGIC TERMITE MOUND SOILS AND THEIR POTENTIAL HEALTH EFFECT ON PREGNANT WOMEN IN ONANGAMA VILLAGE, NORTHERN NAMIBIA

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Geophagy, a common practice of eating earth materials such as clay is more common in pregnant women and children under the age of three. Historically, geophagy has been observed among people (and animals) in all parts of the world since ancient times. In Africa, the practice is common mainly in South Africa, Malawi, Zambia, Zimbabwe and Swaziland where clay ingestion is widespread among women. Reasons for Geophagy in Pregnancy (GIP) are linked to physiological and psychological while factors such as cultural and socioeconomic motivations also play a major role. Geophagy has both beneficial and detrimental health implications. It has a risk of concomitant detrimental maternal and foetal health effects. Despite the negative connotations that have been ascribed to it, the practice still remains very widespread and have no boundaries with regard to race, socio-economic status, age, religious orientation or ethnic origin. Soil may be directly ingested from the ground, but in many situations there is a cultural preference for “special sources” soil, such as the walls of termite nests or traditional herbal-soil mixtures. Though geophagy is known and reported as a common practice among Namibian population, there is no documented evidence on its prevalence or its health effects. The present study aims, therefore to establish the prevalence of this practice and its possible health effects on pregnant women in a small rural village of Onangama in the Northern part of Namibia. This will be achieved through the geochemical and mineralogical study of soil material that is consumed and correlation (if any) will be assessed through a health survey on pregnant women from the study area.

SD-55 IODINE AND THE PREVALENCE OF ENDEMIC GOITER IN NIGERIA – A CASE STUDY FROM AJARA – BADAGRY IN LAGOS, SOUTH-WESTERN NIGERIA

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Iodine is an important element required by human body for proper thyroid functioning and there has long been an established link between this element and goiter occurrences. Generally, goiter cases have been commonly associated to iodine deficiency in a remote mountainous regions. In Nigeria, studies on prevalence of goiter have been restricted to the basement metamorphic/ igneous rocks (Egbuta et al., 2003) and the central Nigeria (Sharbari et al., 2007). It is notably in Enugu, Cross-River and Benue where endemic goiter due to iodine deficiency has been identified with TGR almost greater than 60% (Egbuta et al., 2003). Lar (2013) reported that no goiter cases have been identified from communities within the sedimentary basins and coastal areas of Nigeria. Also, goiter belt map for Nigeria by Isichei et al., (1987) put some sedimentary/coastal regions in Nigeria i.e. Lagos, Ogun and Bayelsa on a goiter prevalence scale of 0–5. Although, it is generally believed that people living on the sea coast have sufficient supply of iodine however, Sharbari et al., (2007) stated that this does not guarantee iodine sufficiency. This statement amongst others might justify the possibility of the occurrences of goiter in some of the sedimentary/coastal environment in Nigeria i.e. Ogun and Lagos (Ghadbe Oyesanya, 2005; www.thenatationonlineing.net). However, a thorough review has shown that very little to no study has been carried out in Nigeria to examine goiter’s prevalence in its sedimentary/coastal environments. Hence, the important need for appraisal of the prevalence of endemic goiter in such environment.

REFERENCES
7. www.thenatationonlineing.net (04 2014) Lagos begin battle to rid Badagry of goiter, site assessed on April 14, 2017

PUBLICATIONS
PUB-01 LOCAL HEALTH ISSUES FROM ENVIRONMENTAL SOIL PHYSICS EXPERIMENTS
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Background On assignment from the Swedish defense research agency lysimeter and pluviation experiments were performed to study soil transport of fission products: caesium-137, strontium-90 and plutonium-239. 50-years later neighbors were concerned about an increased number of cancer cases in adjacent areas. The environmental health clinic at Uppsala university hospital was consulted together with municipality authorities. Method Population data from the two areas with the experiment were matched together with the number of cases of malignancies from the Regional oncoligic center. Using GIS-technique and geocoordinates the distances from the experiment site to the places of domicile for the population were calculated. Both descriptive statistics of cancer incidence with chi-square analysis and logistic Poisson regression analysis were applied to data. Results Descriptive statistics showed an increased incidence of cancer closer to the experiment site to the places of domicile for the population were calculated. Both descriptive statistics of cancer incidence with chi-square analysis and logistic Poisson regression analysis were applied to data. Results Descriptive statistics showed an increased incidence of cancer closer to the field experiment sites (M-H Chi2 p< 0.0001). On the other hand, when possible confounding from age, years living in the habitat and gender was introduced in the logistic model, only age and years living in the habitat were significantly related to cancer incidence (p< 0.0001). Conclusion The observation from the local population, that there was an increased occurrence of cancer closer to the experimental areas, was confirmed, but could probably be explained by a spurious relation to age, where more elderly people lived close to the sites. In the aftermath ethical questions were raised why the local population was not informed about these experiments in their neighborhood.
The Labin city area (North Adriatic) is known for more than three hundred years old exploitation of the Raša coal, which had high calorific, radioactivity, and sulphur values. Several small coal-fired power plants, metal factories, and foundries were operating successfully until late 1990s. Due to lack of proper environmental legislative in the past, and today’s derelict mill legacy, there are several pollution hotspots. Following the air-drying, grinding, and digestion of soil and lettuce samples in acids, elemental analysis was carried out by HR ICP-MS and AAS. By using Sr values from the regional geochemical map, calculated soil enrichment factor and geo-accumulation index maximum values are as follows: Hg 28.2 and 3.7, Cd 9.3 and 2.4, V 6.0 and 1.5, Se 11.9 and 2.6, Pb 12.3 and 3.6, Cr 49.0 and 4.4, Zn 25.0 and 5.5, Cu 83.4 and 5.1, and U 5.7 and 2.9, respectively. These values are indicative of severe soil pollution in the studied location, thus calling for further detailed investigations. As regards the lettuce samples, element ranges (mg/kg d.w.) are following: Hg 0.03, Cd 0.06-0.38, V 0.39-8.33, Se 0.13-2.53, Cr 0.13-8.2, Sr 0.00-18.40, Cd 0.09-5.48, Zn 6.90-20.28, Cu 2.34-12.79, and U 0.03. Estimated daily intakes (mg/day) of Cd (31.2), Pb (21.6), Cr (13.82), and Se (2.73) are lower than the threshold values (EF < 2) by WHO/FAO. However, the estimated daily intake (mg/day) of Sr is 33.58, which is tenfold the normative intake in Croatia. This could be attributed to soil pollution with Se due to the Raša coal combustion.

**RISK ASSESSMENT OF POTENTIALLY TOXIC TRACE ELEMENTS IN SOILS AND LETTUCE FROM THE RAŠA COAL MINING AND METAL INDUSTRY AREA. (LABIN CITY, CROATIA)**

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The only coal-fired power plant in Croatia is situated near the city of Labin, on the east coast of the Istrian Peninsula (the Northern Adriatic Region). The Raša coal (with super-high content of sulphur, up to 14%) was mined at six localities around the city of Labin for more than a century. Our latest research showed that the soil surrounding the plant is highly polluted with PAHs, and moderately polluted with potentially toxic trace elements Cd and Sc. However, the aim of this study was to assess for the first time a health risk for the local inhabitants from Cd and Sc caused by ingestion or dermal exposure to soil particles. The hazard index (HI) was used to assess non-carcinogenic human health risk of Cd and Sc. Since slope factors for Cd and Sc based on oral or dermal exposure of general population are not assigned due to the lack of evidence of carcinogenicity, we were not able to calculate carcinogenic risk from Cd and Sc present in soil. The results showed that the calculated non-carcinogenic risk due to Cd (HI = 0.06) and Sc (HI = 0.02) were well below the threshold value (HI = 1) for both adults and children, indicating that exposed individuals are unlikely to experience adverse health effects. However, further detailed investigation including larger number of potentially toxic and carcinogenic trace elements will be conducted in the future. These results will provide basic information of metal pollution control and environmental management in the Labin area.

**HEALTH RISK ASSESSMENT OF POTENTIALLY TOXIC TRACE ELEMENTS IN SOIL Polluted by the RAŠA COAL COMBUSTION IN A CROATIAN COAL-FIRED POWER PLANT**

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Biogeneous mineral concrements of different origin have been studied on mineralogical aspect of crystal growth theory as biogeneous stones arise and grow in human body. The findings confirmed that the radiation situation in the Orel region returned to normal. However, the issue of payments to the population remains controversial: we can talk about the health of the population of the Orel region, which directly affected 30 years ago during the Chernobyl accident.

**AN ECOLOGICAL ASSESSMENT OF THE PRISTINE PRAŠINSK SPECIAL RAINFOREST RESERVE**

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Croatian forest reserves are among the richest in EU. One of them is the Prastinsk rainforest, declared as a special forest reserve since 1928, which is located near the major highway linking Western and Eastern Europe. It has the second tallest oak in Europe (39.6 m), the age and girth of which are 350 years, and 7.82 m, respectively. More than 20 years ago, numerous mines were placed in the area because of Croatian War of Independence, having threatened visitors and scholars to this day. During the late August 2015, soil, moss, and mushroom samples (n = 26) were collected from the protected location. Following their air-drying, grinding, and digestion in acids, elemental analysis was carried out by HR ICP-MS and AAS. By using Sr values from the regional geochemical map, calculated soil enrichment factor and geo-accumulation index maximum values are as follows: Hg 28.2 and 3.7, Cd 9.3 and 2.4, V 6.0 and 1.5, Se 11.9 and 2.6, Pb 12.3 and 3.6, Cr 49.0 and 4.4, Zn 25.0 and 5.5, Cu 83.4 and 5.1, and U 5.7 and 2.9, respectively. These values are indicative of severe soil pollution in the studied location, thus calling for further detailed investigations. As regards the lettuce samples, element ranges (mg/kg d.w.) are following: Hg 0.03, Cd 0.06-0.38, V 0.39-8.33, Se 0.13-2.53, Cr 0.13-8.2, Sr 0.00-18.40, Cd 0.09-5.48, Zn 6.90-20.28, Cu 2.34-12.79, and U 0.03. Estimated daily intakes (mg/day) of Cd (31.2), Pb (21.6), Cr (13.82), and Se (2.73) are lower than the threshold values (EF < 2) by WHO/FAO. However, the estimated daily intake (mg/day) of Sr is 33.58, which is tenfold the normative intake in Croatia. This could be attributed to soil pollution with Se due to the Raša coal combustion.

**ORE MINERALIZATION OF THE ZAVOJIŠNICA RIVER**

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Biogeneous mineral concretions of various localization as stones in human body are alien pathogenic formations that cause a set of dangerous diseases. Among these biogeneous formations are calcifications, bilious and salivary stones calcifications, other mineral formations. We believe mineralogical base of crystal growth theory as biogeneous stones arise and grow in human body.
We implemented a complex of physical testing methods, among them are optical microscopy, X-ray powder diffraction, XPD, X-ray Computed microTomography, μCT. General data on the morphology and composition we studied using optical microscopy. X-ray powder diffraction detected crystalline phase composition, but concretions also contained amorphous phases. So we used X-ray Computed microTomography, its advantages for studying biogenic minerals analysis is obvious: the method is non-destructive and permits fast quantitative estimation of internal structure characteristics, i.e. without crushing; testing under room temperature. Thereby X-ray Computed microTomography allows to visualize internal volume of any object without destruction, thus determining its morphology and phase composition.

Actually mineral concretions display heterogeneous phase composition and morphology, irregular forms twisting edges, and usually have organic tissues in central part. Calcifications consist of 5-6 phases, two belong to an organic fabric (possibly proteins and lipids), other 3-4 mineral phases are wavenet, hydroxyapatite, hydrocarbonate and calcite of different density. The formed and young arising calcifications 30 microns size have been compared. Both organogenic calcifications have considerable similarity of phase composition, but the young one also contains less than 0.15 wt.% of organic matter. Thus the young calcifications has already initiated the development of aftherosclerotic process. XCT tomograms of the saline stone display morphology similarity to the one of mineral substance, for example ferromanganese nodules or pearls, but differ in phase composition. XPD of various saline stones detected composition similar to calcifications, but gallstones were of different phase composition.

Biogenic concretions calcifications, saline stones and gallstones differ in phase composition and morphology, mechanisms of their nucleation and growth. The used mineralogical approach is alike histology in medical and biological studies, but may better promote disease course explanation, revealing mechanisms of the calcification process development, being aimed at the human health protection.

PUB-08

FOREST FIRES, METAL MOBILITY AND HEALTH: DOES INCREASING FIRE FREQUENCY POSE A RISK TO HUMAN HEALTH

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Forest fire is a global phenomenon that occurs in most terrestrial ecosystems, especially in arid and semi-arid environments. More than 30% of the Earth’s land surface is subject to a significant frequency of fires and the United Nations estimate that globally fires burn around 650 million ha of forest annually. In the forest soils, naturally occurring and anthropogenic added metals are sequestered in sediments, soil organic matter and vegetation, where they are relatively immobile. Moderate to high intensity forest fire (including controlled burning) may alter number of physical and biogeochemical properties of the forest soil including metal bonding and exposure, which potentially increase their mobility into water and air. Fire increases the soil erosion rate up to 100 fold, which facilitates rapid transport of these metals downstream and downstream by runoff and wind and their subsequent deposition in distal soil and water bodies influence on surface and groundwater quality with increased contaminant levels. This may impact on human health as many of the mobilised metals are environmental persistent, toxic to the biota and are easy to accumulate and magnify in the organism through food chain. This is particularly significant given that more than 4 billion ha of forest catchments provide high quality water to communities including 31 major cities in the world. In times of climate fluctuation and with the increased fire frequency, the impact of increased mobility of toxic metals must be assessed in terms of risk to human health.

PUB-09

MERCURY IN BLACK SHALES OF SWEDEN

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Toxic properties of black shales (BS) are known since the ancient times. The influence of mercury – even in small amount – can cause serious health problems and, in particular, this poisoning is a threat to fetal development and child development in the early stages of life. Mercury can have a toxic effect on nervous, digestive and immune systems, as well as lungs, kidneys, skin and eyes.

We explored and studied the occurrence of mercury in forest fire affected ecosystems and in various organic materials as possible pollution sources. Organo-mercury compounds are one of the toxicants that are stable in many cases for long periods. The mass of material in the sample solution is determined by the ICP-MS method, because there is no adverse effect of the additionally administered chemical elements. It should be noted that the analysis of aqueous solutions allows to maximally realize the opportunities of the ICP-MS method, because there is no adverse effect of the additionally administered chemical reagents and it decreases the influence of aluminosilicate matrix, which leads to a decrease of detection limits on the order of 2-3 and for mercury – 0.0008 ppm.

Table. The content of mercury in black shales and its nano-fractions, ppm

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PUB-10

FLUORINE IN DRINKING WATER AND MORBIDITY TEETH CAVITIES IN CHILDREN LIVING IN DIFFERENT MEGACITIES OF RUSSIA

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In recent years, many researchers have shown that the number of chemical elements in black shales may be represented not only in the form of minerals and micro-minerals, but also in the form of particles of ultra-small size (less than 1000 nm) [5].

Not so long ago, due to the unprecedented growth of analytical techniques and new technologies it became possible to solve the problem of separation of nanoparticles from rocks and soils [6].

Determination of mercury in black shales of the Baltic paleobasin was performed using the Zee-ICP-MS method, its advantages for studding biogeneous minerals analysis are obvious: the method is non-destructive and permits fast quantitative estimation of internal structure characteristics, i.e. without crushing; testing under room temperature. Thereby X-ray Computed microTomography allows to visualize internal volume of any object without destruction, thus determining its morphology and phase composition.

The method is based on treating of rock samples with water under certain conditions, to provide the completeness of the selection in the solution of all forms of chemical elements, having a particle size up to 1 micron. Colloid-salt aqueous solution is analyzed by ICP-MS for the maximum possible range of chemical elements. It should be noted that the analysis of aqueous solutions allows to maximally realize the opportunities of the ICP-MS method, because there is no adverse effect of the additionally administered chemical reagents and it decreases the influence of aluminosilicate matrix, which leads to a decrease of detection limits on the order of 2-3 and for mercury – 0.0008 ppm.

Using the developed methodology, the analysis of the Baltic paleobasin black shales nano-fractions was performed (Table). The analysis of the data shows that the nano-fractions content in the samples of black shales ranges from 0,3 to 7,1 wt.% , and the mercury content reaches 10,23 ppm.

Actually mineral concrements display heterogeneous phase composition and morphology, inorganic and semi-arid environments. More than 30% of the Earth's land surface is subjected to a significant frequency of fires and the United Nations estimate that globally fires burn around 650 million ha of forest annually. In the forest soils, naturally occurring and anthropogenic added metals are sequestered in sediments, soil organic matter and vegetation, where they are relatively immobile. Moderate to high intensity forest fire (including controlled burning) may alter number of physical and biogeochemical properties of the forest soil including metal bonding and exposure, which potentially increase their mobility into water and air. Fire increases the soil erosion rate up to 100 fold, which facilitates rapid transport of these metals downstream and downstream by runoff and wind and their subsequent deposition in distal soil and water bodies influence on surface and groundwater quality with increased contaminant levels. This may impact on human health as many of the mobilised metals are environmental persistent, toxic to the biota and are easy to accumulate and magnify in the organism through food chain. This is particularly significant given that more than 4 billion ha of forest catchments provide high quality water to communities including 31 major cities in the world. In times of climate fluctuation and with the increased fire frequency, the impact of increased mobility of toxic metals must be assessed in terms of risk to human health.

Dietary shark oil are specialized in U-V-Mo, moreover they are enriched with a significant amount of copper, nickel, cobalt, zinc, lead and other chalcophile elements. For some elements the content can reach the following values (ppm): U – 300, V – 1000, Mo – 360, Cu – 365, Ni – 190.

According to M.P.Krivtsov and Yu.V.Usvyatskaya some black shales of the Baltic paleobasin were performed using the Zee-ICP-MS method, its advantages for studding biogeneous minerals analysis is obvious: the method is non-destructive and permits fast quantitative estimation of internal structure characteristics, i.e. without crushing; testing under room temperature. Thereby X-ray Computed microTomography allows to visualize internal volume of any object without destruction, thus determining its morphology and phase composition.

Mercury – even in small amount – can cause serious health problems and, in particular, this poisoning is a threat to fetal development and child development in the early stages of life. Mercury can have a toxic effect on nervous, digestive and immune systems, as well as lungs, kidneys, skin and eyes.

Mercury is one of the most dangerous elements-pollutants of the biosphere with the highest toxicity among heavy metals, due to its chemical and geochemical features. Mercury is able to block protein molecules, to break their biosynthesis, to cause metabolic changes in DNA, to suppress growth and accelerate aging of plants. Mercury organic compounds are the most dangerous, because they are much more toxic and are being actively absorbed by living organisms [1-3]. The mercury distribution in sediment rocks is fairly evenly, however, in some cases there is an increase of its content in rocks, enriched with carbonaceous matter.

Baltic paleobasin of the dictyonema black shale is located in the south-western and southern part of the Baltic crystalline shield and belongs to Vendian-Paleozoic platform cover. Sediments of the upper Cambrian-Lower Ordovician extend from areas of southern Sweden and Estonia to Leningrad region (Russia).

Dictyonema shale is a carbonaceous-argillaceous rocks containing up to 25% of the organic matter. clay and silty-sand particles. They contain illite, kaolinite, montmorillonite, chlorite, quartz, feldspar, pyrite, calcite, iron oxides and hydroxides, and carbonate, silicate, phosphate and sulphide concretions.
The main natural source of fluoride in the human organism is drinking water. The maximum absorption of fluoride occurs during growth and development, when the hard tissues of the teeth still forming. According to the World Health Organization (WHO), tooth caries is related to global health problems. In Russia, the disease ranks first among other topical problems of modern dentistry (Kuzmina E.M., 2011; Akhmedov V.V., et al., 2014). Various levels of tooth caries population of different regions led to the conclusion about the existence of depending on the origin and development of tooth caries by environmental factors.

The aim of the study was to examine the prevalence and intensity of tooth caries flow, the level of individual oral hygiene in children of different ages and to determine the features microcrystallisation saliva on the degree of activity and intensity of caries process, depending on the fluoride content in drinking water.

A clinical dental examination of the 971 child (435 boys and 536 girls) aged 6-7 years constantly living in the cities of Moscow, Saint-Petersburg and Karek. It was found that children living in these magnetites there is a high prevalence of tooth caries, which is 95-97.5%. The intensity of the flow of tooth caries by the index of the CTI for children aged 6-7 years is as follows: 3-4 – filling, 4 – extracted extracted tooth, and 5 – caries, “F” – filling,” E” – extracted tooth, and “c” – caries, “F” – filling “c” – children in these magnetites. Established correlation intensity flow caries in children by type of saliva microcrystallisation. With intensive flow caries types of the third degree of activity of caries process (decompensated form) in children are more common pattern of saliva microcrystallisation at II B and III type for Puzikova O.J. (1999). Reduced level of individual oral hygiene; identified among groups with a high content of different caries process is mainly to low awareness of parents on individual oral hygiene and prevention of tooth caries in children of this age.

The fluoride content in the drinking water residents of cities investigated regions is different, but in terms of the prevention of tooth caries is low enough values: Moscow – 0,01-0,02, Saint-Petersburg – 0.02-0.034, Karek – 0.32-0.41 mg/l.

Thus, the deficiency of fluoride in the drinking water is one of the main factors determining the high prevalence and intensity of tooth caries in children aged 6-7 years constantly living in different magnetites of Russia. Therefore the problem of the shortage in the organism of this element for the Russian population living areas with low fluoride content in the environment for the prevention of dental caries, remains actual.

**PUB-11**

**MUMJHO (SHILAJIT) AT BAikal**

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Mumjho-bearing Baikal confirmed the discovery of the almahtrumumjho on the west coast in the valley Srednie Khomuty (N52 ° 10'11.55 "E105 ° 35'47.11 ").

Mumjho-bearing Baikal confirmed the discovery of the almahtrumumjho on the west coast in the valley Srednie Khomuty (N52 ° 10'11.55 "E105 ° 35'47.11 ").

Thus, the deficiency of fluoride in the drinking water is one of the main factors determining the high prevalence and intensity of tooth caries in children aged 6-7 years constantly living in different magnetites of Russia. Therefore the problem of the shortage in the organism of this element for the Russian population living areas with low fluoride content in the environment for the prevention of dental caries, remains actual.

**PUB-12**

**THALLIUM POLLUTION RECORDED IN A SEDIMENT PROFILE NEAR A STEEL PLANT, SOUTH CHINA**

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Thallium (Tl) is a rare element and heavy metal with high toxicity. It bears unique elemental properties and is primarily used in air and drinking water quality. A MODERN INTEGRATED APPROACH TO ESTABLISHING NATURAL AND TECHNICAL SYSTEMS

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Development and implementation of any natural and technical systems (NTS) must be accompanied by a suite of mandatory programmes and subsystems that ensure sensible and safe management of subsurface resources. A complex of productive (technological) NTS assets should incorporate a starting suite that is broken down into:

1. A programme on compulsory scientific research on studying local geochromatic cycles in order to evaluate how a proposed NTS will affect local residents’ health.
2. A system of environmental baseline monitoring that includes compulsory monitoring of the atmosphere and hydrosphere within the adjacent areas and rests for the results produced by the scientific research (paragraph 1);
3. A programme on estimating accumulated environmental damage and mitigating consequences that arise from exploitation of natural systems and landscapes.
4. A health insurance programme that provides insurance coverage for people suffering from endemic diseases common for geological landscapes where an NTS is located;
5. An environmental insurance programme that elaborates in detail any potential risks (of medium to high probability) when environmental media are affected by human impact inflicted by an NTS;
6. A programme on informing local residents online about the status of environment’s components and explaining how an NTS is affecting health of organisms involved in local geochromatic cycles.

A new NTS must be commissioned only if the programmes above have been taken into account. The already existing systems must be expanded with these subsystems. When we consider the current level of information and computer technologies worldwide and drawing upon experience gained by top-performing countries in environmental protection and responsible management of subsurface resources, we can conclude that major transformations await Russia’s environmental industry in the nearest future.

**PUB-13**

**OCCURRENCE OF THALLIUM IN TYPICAL INDUSTRIAL WASTEWATERS AND ITS ENVIRONMENTAL IMPACTS**

Jin Wang, Yuyang Lin, Juan Liu*, Meiling Yin, Xiaohui Wu, Jianmin Ren, Junyi Zhou, Peiwei Huang, Xiaohuang Yang, Xuxue Luo, Tanguo Xiao, Yong-Heng Chen
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Thallium (Tl) is a non-essential heavy metal. Serious Tl pollution incidents successively occurred in the Pearl River, China. In this study, we presented a very first comprehensive report of Tl concentrations in typical industrial wastewaters and natural waters courses in the Pearl River Basin. The results unveiled that the wastewater from a Pb-Zn smelter had the highest Tl concentration, followed by wastewaters from a Zn refining plant, and wastewaters from a steel plant wastewaters. Tl elevation in these wastewaters is mainly due to low melting and boiling temperature of Tl compounds. Very high enrichment of Tl (several tens of mg/kg) was found in the raw Pb-Zn ores used for production in the Pb-Zn smelter. The Zn refining plant utilized Tl-rich ash waste. Though Tl content in the raw Fe-oxide ores of the steel plant is relatively low, with contents usually lower than mg/kg, high production temperature over 1000 °C just vaporized Tl compounds almost completely into vapor, which goes directly into the wastewater during the process of wet dust removal. River waters near the point sources mentioned above mostly had higher Tl level than the drinking water limit in China.

This project was supported by the National Natural Science Foundation of China (41573006; 41203002; 41573119), the Guangzhou Science and Technology Programme (20150010205), the Guangdong Provincial Natural Science Foundation (2014A030313527), and Undergraduate Innovation Project (201611070838).

**PUB-14**

**OCCURRENCE OF THALLIUM IN TYPICAL INDUSTRIAL WASTEWATERS AND ITS ENVIRONMENTAL IMPACTS**

Jin Wang, Yuyang Lin, Juan Liu*, Meiling Yin, Xiaohui Wu, Jianmin Ren, Junyi Zhou, Peiwei Huang, Xiaohuang Yang, Xuxue Luo, Tanguo Xiao, Yong-Heng Chen
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Thallium (Tl) is a rare element and heavy metal. Serious Tl pollution incidents successively occurred in the Pearl River, China. In this study, we presented a very first comprehensive report of Tl concentrations in typical industrial wastewaters and natural waters courses in the Pearl River Basin. The results unveiled that the wastewater from a Pb-Zn smelter had the highest Tl concentration, followed by wastewaters from a Zn refining plant, and wastewaters from a steel plant wastewaters. Tl elevation in these wastewaters is mainly due to low melting and boiling temperature of Tl compounds. Very high enrichment of Tl (several tens of mg/kg) was found in the raw Pb-Zn ores used for production in the Pb-Zn smelter. The Zn refining plant utilized Tl-rich ash waste. Though Tl content in the raw Fe-oxide ores of the steel plant is relatively low, with contents usually lower than mg/kg, high production temperature over 1000 °C just vaporized Tl compounds almost completely into vapor, which goes directly into the wastewater during the process of wet dust removal. River waters near the point sources mentioned above mostly had higher Tl level than the drinking water limit in China.

This project was supported by the National Natural Science Foundation of China (41573006; 41203002; 41573119), the Guangzhou Science and Technology Programme (20150010205), the Guangdong Provincial Natural Science Foundation (2014A030313527), and Undergraduate Innovation Project (201611070838).
Cadmium is mainly found in copper-pyrite, polymetallic, lead-zinc ores. In the ores of deposits being continuously developed and being commercially exploited of Russia, the cadmium content ranges from 0.006 to 0.018% in copper-pyrite ores, from 0.2 to 0.5% in polymetallic ores. The maximum values of cadmium content among copper-pyrite deposits are characterized by Alexandrinsky and Talgan (Chelyabinsk region) – about 0.019%.

Among the polymetallic and lead-zinc deposits, Zheleznovode (Primorsky Krai) – 0.088%, Rublevskoye and Korbalikhinsky (Altai Krai) – around 0.06%.

The mining enterprises of Russia, which extract copper-pyrite ores, include OAO Udachinsky GOK, LLC Bashkir Copper, OJSC Bamburevsky GOK, OAO Bashkintset, MAZ Ormet, OAO Sverdlovsk GOK OISC, MMC Dalpolimetal OISC, Shrib-Polymetal OISC, Novo-Sharskol'sky Radnik OISC, as well as new enterprises – Balakural and Kyzyl-Tashlyksky GOK. According to our calculations, the ore mined contains about 170 thousand tons of cadmium annually, while only 1 thousand tons of cadmium is released into commercial products (metal cadmium). The main losses are associated with the waste of enrichment, which accumulate in the tailing dumps.

The example of MMC Dalpolimetal (Primorsky Krai) for the period 2009-2014 analyzed cadmium emissions. The bulk of cadmium is concentrated in lead concentrate (from 50 to 90%), with a tendency to reduce the recovery of cadmium, which is associated with both a deterioration in the quality of the initial ore and a decrease in the process of some cadmium in the ore enters the final product – goes to the tailings, accumulating in the tailing pond.

For a long time, the lead concentrates of JSC Dalpolymetal were processed on-site in the village of Raduyana Pristun with the production of lead by the obsolete technology of rock melting, with no cadmium being recovered. According to the results of observations by the Federal Service for Hydrometeorology and Environmental Monitoring, the village of Raduyana Pristun is a territory with a dangerous category of soil contamination with lead, cadmium and zinc.

Part of cadmium concentrates in copper concentrates during the enrichment of copper-pyrite ores. According to our data, more than 100 tons of cadmium with copper concentrates and other products are annually processed into the copper smelting facility of Sevometskay Sniper (SUMAZ, Ravda, Sverdlovsk Region). In the technological process, cadmium passes into all solid products of roasting and melting – in blister copper, slag and lead products (over 82%). The lead product is exported by the enterprises, and the copper products are used in building materials.

On the example of one of the zinc plants in Russia – OJSC Electrozinc (Vladikavkaz) – the behavior of cadmium in the technological process of processing zinc concentrates containing cadmium is analyzed. The bulk of cadmium in the plant's leading concentrating in zinc concentrates, the smaller part in secondary zinc raw materials. At the same time, cadmium is included in the main commercial output (pig iron cadmium), part – into semi-products (oakles and clinker), about 5% – refers to losses (fumes, gases, etc.). In recent years, the extraction of cadmium in commodity products has grown to 86-87%, which is associated with the improvement of the technological process.

Based on data from the Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), regions with an elevated cadmium content in soils have been identified. In particular, such cities include Kirovgrad, Ruseh, Rechta (Sverdlovsk Region), where environments that carry out metallographic processing of cadmium-containing raw materials are located. There are three levels of cadmium content in soils: 1) normal cadmium content (up to 0.006 mg/kg); 2) elevation of cadmium content (0.006-0.02 mg/kg); 3) highly elevated cadmium content (over 0.02 mg/kg). The existence of 3 indicator categories (diseases of the musculoskeletal system, nephrotoxicosis, diseases of the blood and blood-forming organs) is characteristic, which indicates an increased level of negative influence of harmful compounds (in particular, cadmium) on the environment and human health. It is necessary to conduct in-depth monitoring of the situation at metallurgical enterprises related to cadmium.

The movement of information, as well as mass hazard and extreme natural changes, have been studied carefully. The scientific researches submitted through international events on e-Health and Telemedicine for Health of Syria, and individual factors – as the result of the environmental disaster. The researchers of the National Academy of Sciences have been among the leaders in the field of e-Health, have highly appreciated the activity, which will be a great help to prepare for the future. The main achievements of the digital technologies are the ability to access information from anywhere in the world. This is a great help for people living in rural areas, who want to access medical care at a distance. The trend of digital technologies is to improve the quality of life and reduce healthcare costs.
IS ‘URBAN MEDICAL GEOLOGY’ A CONTRADICTION IN TERMS?  

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Medical geology is defined as the impacts of geologic materials and geologic processes on animal and human health. Most urban dwellers, especially in North America, are largely shielded from the centers of population, education, medical facilities, and financial and political power, it is essential determining their source(s), and modes of occurrence. In short, medical geology is an active, but un-

PUB-20  

The Touch of Health in the Recipes Taken from the ‘Lapidari-Us’ by Peter of Spain  
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Peter of Spain, Latin Petrus Hispanus (c. 1215-1277), doctor, philosopher, and the conse-

PUB-21  

A Better Precision of Health Impact Using Individual Exposure Design Instead of Ecological Design  
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Introduction. Five percent of the released cesium-137 (Cs-137) from the Chernobyl nuclear power plant accident in 1986 was deposited in Sweden. We studied the total cancer incidence using parish versus individual levels of exposure. Results from the two methods will be compared at 1986. Strength and limitations with the two methods will be discussed in terms of ecological bias and statistical power.

Methods. A digital map on the deposition of Cs-137 in kilo Becquerel/m² (kBq/m²) from the Geological Survey of Sweden was used to create a surface-weighted average at parish level (parish = 612) for 9 counties in 1986. An individual 5-year cumulative exposure value was calculated from the deposition at the annual dwelling coordinate, in the three most contaminated counties, taking into account the physical decay of Cs-137 and changing of the residence 1986-1990 (n = 734,537). From the National Board of Welfare 22,467 cancer cases 1986-2009 and 82,495 cancer cases 1991-2010 was retrieved, respectively. The total cancer incidence rate ratio (IRR) was calculated with Poisson regression and Hazard Ratio (HR) with Cox regression, respective-

Conclusions. Using individual exposure assessment revealed a weak exposure response trend, not seen in the ecological study design.

PUB-22  

Diabetes Appearance in Anomalous Magnetic Field  
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Introduction and Aim. All that exists in the Earth magnetic field (EMF) has paramagnetic characteristics and gets magnetized. To confirm EMF presence in the beds of people suffering from D and AMF correlation with body organs in charge of glycose metabolism in two groups of patients (30-30).

Work Method. Magnetic field measurements have been performed with a protonic magnetometer, D type 1 and 2 patients' beds. EMF and AMF intensity of both groups have been measured. Furniture rearrangement has been done in order to place “A” group into EMF and health of both groups was observed during 3 years. D etiopathogenesis has been studied.

D patients in “A” and “B” groups are 20-64 years old. “A” group health has been observed in a natural EMF. Health of group “B” has been observed in EMF.

Results. Health of “A” group in EMF has improved but in group “B” in AMF, got worse. High level of difference has been found (X = 32; p < 0.001), also correlation of AMF and the body organs responsible for glycose contents in blood.

We present sketches of AMF in beds of the diseased and healthy ones. Motion of glycose contents in blood. The health of group “A” in EMF got improved but in group “B” in AMF got worse. High level of difference has been found. Many literature observations are explained such as: insulin in circulation deficiency, why does insulin resistance occur. Function of IS is ex-

The main measure treatment of D is staying in EMF.
PUB-27
ANALYSIS ON THE POTENTIAL LANDSLIDE PLAN INLET MULTIPURPOSE DAM SPLITWAY AND OUTLET KARIAN DISTRICT BANTEN PROVINCE

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Karian sub area of Lebak Banten Province is planning the construction of a dam, where the stability of slopes in construction of the dam is one very important factor. On the system construction is sometimes found small avalanches that could lead to occurred a large avalanche, generally caused by the presence of discontinuous area that interferes the construction of the dam.

To prevent the occurrence of such avalanches, then that can be done is the analysis of the stability of slope classification method of rock mass. The method used is the Rock Mass Rating (RMR) and Slope Mass Rating (SRRM). The project Bieniawski (1989), parameters RMR dan SRRM is Uniaxial Compressive Strength (UCS), Rock Quality Designation (RQD), spacing of discontinuous, condition of discontinuous, groundwater, Orientation of discontinuous.

From the results of the analysis rnr on the location of Inlet and Outlet, Splitway in General is 41 > rocks are said to be solid although there are some conditions that had with rating of 35 – 40. After analysis of the RMR further analysis SRRM, with dip direction of discontinuous as well as dip direction of slope. The results of the analysis of the SRRM on three (3) site in General is >42 the mean condition medium rocks, slopes are relatively steady partly, and avalanches controlled by the presence of boulder.

PUB-28
MEDICAL GEOLOGY APPLICATIONS OF AN AFRICA GEOCHEMICAL DATABASE

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Important scientific problems that would confront the construction of an AGD include defining and understanding “regional background”, and the evolution of appropriate sampling and analytical protocols that would take into account the Regions’ unique and complex element distribution patterns. These problems are apparently intractable, but are not unsolvable.

Longstanding operational and logistical problems that have impeded previous (largely uncoordinated) efforts at an AGD compilation include the limited availability of state-of-the art analytical instrumentation and requisite laboratory infrastructure. An even more important limitation is the dearth of a sufficient number of highly skilled analytical geocherts and other technical personnel located at appropriate regional centers, who are able to install, operate, troubleshoot and maintain modern analytical equipment. These problems are compounded by the lack, up to now, of adequate international funding to undertake such a high precision and systematic mapping exercise.

In this presentation, recommendations are put forward for carrying out a successful and complete compilation of a high quality AGD that would be invaluable for studies in Medical Geology, as well as in any array of other multipurpose, multi-national environmental applications; and proposed measures given for countering potential limitations in its development.

PUB-29
THE OCCURRENCE AND THE RISK OF ORGANOPHOSPHORUS PESTICIDES IN JIANGHAN PLAIN GROUNDWATER

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To investigate the distribution characteristics of organophosphorus pesticides (OPPs) in groundwater, 38 groundwater samples based on the established field site with 13 monitoring points and 4 surface water samples were sampled in June, 2015 in Jianghan plain, China. According to the determination of some main chemical parameters and OPPs contents, the distribution characteristics and influencing factors of OPPs in Jianghan plain groundwater were studied. The results showed that groundwater in this area presents mainly HCO3-CaMg type with strong reducibility. OPPs were ubiquitous in our studied area ranged from 31.5 to 264.5ng/L, with the average of 86.5 ng/L. Three of higher OPPs concentrations were onethosphate, methamidophos and diazinon, with the average of 54.3, 32.1 and 27.9 ng/L, respectively. Not only single one but the sum of OPPs concentrations were below MAC standard in “Groundwater Pesticide Residues in Water” (EEC/80/778) and the threshold of drinking water “Hygienic Standard for Drinking Water” (GB 5749-2006) to prove less effect on the local ecological environment. The vertical distribution of OPPs concentration followed as: 50m>25m>10m, while the horizontal distribution following: nearby river farm area> farm area> nearby river area. The distribution characteristics of OPPs were also influenced by many factors, such as application amount of OPPs the interaction between the surface water and groundwater the fluctuation of hydrochemical parameters in groundwater and the biological and non-biological degradation.

PUB-30
DETAILED CHARACTERIZATION AND AMINE BINDING CAPACITY OF NATURAL CUBAN ZEOLITE AS WELL AS ITS ORAL AND TOPICAL APPLICATIONS IN THE MEDICINE

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The use of natural zeolites for medicine requires a detailed analysis of their chemical composition, phase pure, ion-exchange properties and microstructural homogeneity as described (1). This Cuban zeolite contains clinoptilolite and mordenite as major phases (ca. 80%), exhibit large BET surface area (140 m2 g-1), high histamine binding capacity of about 12 mg (pH 1) and 15 mg (pH 7) per grams of zeolite (1) and anti-inflammatory properties (2). The medical application is focused to the gastrointestinal tract. Serotonin is well known as the “hormone for fortune” in the brain, but excessive peripheral blood levels (produced by neuroendocrine tumors, usually known as “carcinoids”) cause serious gastrointestinal dysfunction. As a result, the anti-diarrheal drug (3), it has been applied to patients suffering from severe diarrhea. While histamine is nearly irreversibly bound to zeolite, serotonin shows initially a much higher binding affinity to zeolite which declines gradually over time. The use of zeolite in patients suffering from carcinoid syndrome can reduce significantly the number of bowel movements, but not in all patients. An anthracas zeolite paste for topical application (Detoxsan® Paste) has been prepared (4). The formulation is based on petrolatum and contains additionally squalane as natural lipidic component. The paste is used in irritable, interstigo, prostatitis and inflamed skin areas. In iriscosis and intertrigo the improvement of skin area was visible after 2 to 5 days, in prostatitis between 1 and 3 weeks. Thus, Detoxsan® Paste reduces inflammation promoters (histamine), prevents microbial growth (water adsorption) and promotes healing of the affected skin areas.
Diatomite is formed in water bodies from the mud, representing leaf diatoms, remains of shells cemented by opal, and organic and impurities. Made from amorphous silica shells they have a variety of forms with numerous pores through which the exchange of substances goes with the environment. Porous rock does not sink in water, has a high adsorption capacity, resistant to acids, the refractoriness, low heat and sound conductivity. The properties of diatomite determine its application. Diatomite is demanded for chemical, pharmaceutical, manufacturing, food, construction, electrical and electronics industry. Interest in them is manifest architects, scientists in medicine and material study.

The particle size distribution and physical and chemical characteristics of Karelaitan limestone diatomites were studied with the help of microanalysis, X-ray and laser diffraction, Raman and IR spectroscopy and other methods. Diatomite shells pore distribution on area and radius indicate that a natural diatomite is nonmaterial.

Covering for protecting wooden structures against fire and decay was developed with the use of diatomite as a filler and pigment and liquid silicate glass as a binder. On the basis of diatomite powder the technologies of producing of liquid filters, mineral paints and light ceramics were tested.

The possibilities of the use of diatomite as food additives in animal husbandry and for farming, cosmetics and a delivery drug in medicine are discussed. Copy forms of the diatomite shells may be a promising direction in architecture. In nanotechnology diatomite can be used as a screen for selection of nano-objects on size and as a matrix at replacement of silicon dioxide on other materials, for example, to develop new effective catalysts.

PUB-34

DISTRIBUTION OF ANTIBIOTICS IN ALLUVIAL SEDIMENT NEAR BREEDING AREA AT JIANGHAN PLAIN, CENTRAL CHINA

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Antibiotics have been increasingly detected in groundwater, but the distribution of them in deep sediments of underground are still poorly understood. In this study, the occurrence of sixteen antibiotics in different layers of sediments were revealed in various breeding areas in a small region of Jianghan Plain, such as pig farm, chicken house, fish pond and river bank, which were collected for environmental comparison. The spatial distribution of each compounds in surface sediments has much difference and the partial pollution is serious, the pollution pattern was as follows: river bank > fish pond > pig farm > chicken house. Compared the sediments collected in different depth of layers within 1.5 m, the concentrations of targets were not obvious decreased with depth, and even increasing between 0.6 m to 1.0 m as significant fluctuation. Aquifer sediment analysis indicated that most antibiotics retention within 8 m and little increase between 12-16 m, which were consistent with the depth of sandy aquifer layers. All of the compounds were not detected in deep layer of 20 m, except SDZ and CTC. Tetracyclines and Fluoroquinolones were the two groups observed at higher concentrations in most sediment layers, although the residual level was in a range of several to dozens of ng L-1. The results provided field evidence that antibiotics widely existed in underground environment along with groundwater migration and particle adsorption. It suggests that the effect of deep pollution on ecosystem should be assessed, which is considered as a big challenge to groundwater remediation.
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Ministry of Healthcare of the Russian Federation
MedGeo’17
7th International Conference on Medical Geology
August 28 - September 01, 2017
Moscow, Russia

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