



IMGA LOCAL CHAPTER REPORT 2019

Chapter Name: IMGA URUGUAY

Chapter Leader(s): Nelly Mañay (nmanay@fq.edu.uy)

A. 300 word max up-to-date highlights summary for the IMGA Newsletter:

During 2019, Chapter's members published papers and attended conferences regionally and internationally. Nelly Mañay (chapter leader) participated in many activities at MEDGEO 2019, held in Guiyang, China and there, Elena Alvareda et Al. received a "Best Poster Award" to her presentation. Besides, Ana Lía Noguera, gave a lecture on her research line, in a IMGA Webinar.

Regarding our University Education in Medical Geology, Teresa Heller reported that in 2019, the enrolment numbers in the two main undergraduate courses, "Environmental Toxicology and Medical Geology" and "Advanced Topics in Environmental Toxicology and Medical Geology", in Faculty of Chemistry, continued growing in 2019 in comparison to 2018: from 40 to 60 in the former, and 10 to 25 in the latter, with highly motivated and enthusiastic students attendance. A new updating course was offered for PhD students as well.

Within the framework of his Master's Thesis project in which the problem of arsenic in groundwater is compared to the data of some associated cancers, Mariano Caceres did an internship at UNLaPampa, Argentina. Here, several activities were carried out, to know the problem of arsenic in water in an area where the levels exceed up to 100 times the values allowed by the local norm in many cases.

The AsURU Project formulated and reported by Nelly Mañay, Paula Collazo and Karina Pamoukaghlián, continues its performance but without special funds to search for solutions by the different management responsible stakeholders. The main objective was to improve the knowledge about the presence of Arsenic in Uruguay groundwater, analyzing its behavior in space and time, establishing health risks in the consuming population. According to proposal some progress has already been made: (a) aquifers with Arsenic high levels have been identified; (b) pilot areas have been selected; (c) the affected populations for the evaluation of their exposure to As in water were identified and selected (d) meetings and symposiums were developed for knowledge exchanges and e) the project's leaders also applied for funds in different project calls looking for financial support (CSIC, ANII and CTAguá) this year.

B. Full up-to-date Chapter Report for the IMGA Website:

Please use as much space as you need below to describe the activities of your Chapter until now. Please include (Feel free to leave blank if there's none under the category):

1. Reports of any Chapter meetings; promotional activities; conferences/workshops that your Chapter has organised – please include the programme and copies of the abstracts;

This year, members of IMGA Uruguay promoted MedGeo through the main educational activities (Teresa Heller & Nelly Mañay) as a poster presented in MEDGEO 2019 (Guiyang, China Aug 2019) and as an invited speaker in the University of La Pampa, for an oral presentation on "Introduction to Medical Geology and regional examples of multidisciplinary cooperation activities (Mariano Caceres).



PROGRESS IN MEDICAL GEOLOGY EDUCATION IN URUGUAY



Teresa Heller & Nelly Mañay.

Toxicology Area, Faculty of Chemistry, University of the Republic, Uruguay.

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8th International Conference on Medical Geology, August 12-15, 2019, Guiyang, Guizhou

2003: 1st short course in Montevideo held by international experts. Med Geo: an emerging discipline.

2005: 1st University course including MedGeo topics in Uruguay

2009: Hemispheric Conference in Montevideo

2010: Uruguay Chapter creation

University Med Geo Education in Uruguay.
2006 up to now: 7-week-course "Environmental Toxicology and Medical Geology" (ETMG) taken by 700 students from Chemical Sciences and Geosciences. Undergraduate and postgraduate level

2017: "Advanced Topics in Environmental Toxicology and Medical Geology", 7-week-course, following ETMG.

2018: "Update in Environmental Toxicology and Medical Geology" 14-week-course, exclusively postgraduate, included in the Governmental Basic Sciences Development Program (PEDECIBA)

2020: Diploma in Medical Geology to be launched, aimed at University graduates from Geosciences and Biosciences

Syllabus and curricular structure. Total :30 credits. 20 credits in courses and 10 credits in a Project, regionally designed and presented by the student. Online course, also presental option.

Areas: Medical Geology - Environmental Toxicology - Environmental Epidemiology – Geochemistry – Risk Assessment

CICLO DE CHARLAS

Lic. Mariano CÁCERES HAPPEL

Egresado de la Licenciatura en Geología de la Universidad de la República, Uruguay

OLOGÍA MÉDICA: COOPERACIÓN MULTIDISCIPLINAR, EJEMPLOS EN LA REGIÓN."

Miércoles 28 de Noviembre

19.30 hs- Aula 8 de la FCEyN



FACULTAD DE CIENCIAS EXACTAS Y NATURALES

www.fceyn.edu.uy

2. Lists of Medical Geology papers/reports, conference presentations and research projects being carried out by your Local Chapter members;

- *Mañay, N.*; Pistón, M.; Cáceres, M.; Pizzorno, P.; Bühl, V.* Science of the total Environment. 2019. An overview of environmental arsenic issues and exposure risks in Uruguay 686, 590-598. DOI: 10.1016/j.scitotenv.2019.05.443.*

Abstract: Evidence for low-dose health effects of Arsenic (As) in humans is still controversial and presents a major public health issue in several countries worldwide. It is not clear yet, whether there is a lower safe threshold for arsenic in drinking water among other possible sources such as food, below which, exposures are not harmful. In Uruguay, safe drinking water is supplied to 94% of the population by a state company (OSE) and As levels in workplaces and food are officially regulated. This paper aims to present and discuss the issues regarding arsenic exposure risks to the environment and human population, which are being addressed in a multidisciplinary manner in Uruguay since 2007. An overview is given on both the background and the current situation, presenting reports and research studies conducted on these problems by various academic, state, and private institutions that deal with regulations, surveillance, and health care. Scientific research on geogenic As levels in groundwater indicates As levels above those recommended by the WHO for drinking water ($10 \mu\text{g L}^{-1}$) in different Uruguayan aquifers. There is a lack of baseline studies concerning Uruguayan residents that are exposed to As in drinking water over time. Furthermore, there is a need for data on environmental chemical exposure that could be associated with disease or death in the country. In addition, only a few As risk exposure assessment studies in children, adults, and workers using biomarkers in urine are available. Furthermore, this paper presents As levels in a rice growing region and the spatial distribution of groundwater arsenic data compared to a national cancer atlas database as ongoing research advances. Multidisciplinary research projects and local future actions are also described. This contribution constitutes a first attempt to develop a feasible health risk assessment of low-dose arsenic exposure in this Latin-American country.

- *Machado I, Bühl V, Mañay N Total arsenic and inorganic arsenic speciation in groundwater intended for human consumption in Uruguay: Correlation with fluoride, iron, manganese and sulfate.. Science of the Total Environment 681 (2019) 497–502.*

Abstract: Medical Geology is a growing field in Uruguay and the groundwater quality has been the focus of multiple studies, being As levels one of its main concerns. The aim of this study was the application of analytical methodologies for the assessment of total arsenic and inorganic arsenic species, fluoride, iron, manganese and sulfate in groundwater samples from private wells, used for human consumption, and to evaluate the possible correlations among these parameters.

Groundwater analysis showed that in some sampled points, As levels were above those recommended by WHO guidelines for drinking water, being the highest values found in samples from the “Thermal Corridor” and the Cretácicos Sur aquifer. Parameters such as F⁻, Mn and SO₄²⁻ also presented higher concentration values than those recommended by WHO in some of the samples. The lack of knowledge of As in groundwater issues as a drinking water source for human consumption in Uruguay is a major area of interest in Medical Geology research, as there is also a lack of epidemiological studies on As exposure health risks. As levels in groundwater and its relationship with other elements, should be deeply studied to prevent long-term health effects. The results of this ongoing study will contribute not only to the

understanding of the As situation of groundwater in Uruguay but also to expand the existing information on the distribution of As species in the regions of the world.

- *Project Report, As URU: Arsenic in groundwater in Uruguay and associated health risks by Collazo, P., Mañay, N., Pamoukaghlián, K.*

Abstract : The problem of Arsenic contamination of groundwater is a very important environmental health issue for the country, since a large part of the rural population is supplied with groundwater for consumption. Although there are water potability standards, there are no systematic studies of groundwater quality or the health impact of exposure to this metalloid. However, a first approach was recently made to try to correlate the risk of melanoma cancer in men and women, by department, with high Arsenic values, with interesting results (Mañay et al., 2019). To try to solve this problem, the multidisciplinary project "Arsenic in groundwater of Uruguay and associated health risk" (AsURU) coordinated by the Faculty of Sciences and the Faculty of Chemistry of the UDELAR was launched, with the participation of public organisms. Values higher than those allowed by current water quality standards have been found, in the sedimentary aquifers Raigón and Mercedes and in the cracked aquifer of the Piedra Alta Terrain (limit according to WHO <0.01mg / l; in Uruguay still applies <0.02 mg / l). As a result, four pilot zones were defined in the framework of the AsURU Project: (1) Conchillas with concentrations of As > 0.03 mg / l; (2) Young, according to the historical record of high As values (As > 0.01 mg / l) and the prolonged consumption of 100% of the population; (3) San Javier with As values > 0.01 mg / l; (4) Libertad, where As values are recorded between 0.01 and 0.03 mg / l. The problem of achieving permissible ranges in groundwater must be solved and it is not only a challenge for the country, but is a need to guarantee the well-being and health of its inhabitants

- *Project Report: Quality and Safety of Water: Groundwater Hydrochemistry Studies from North of Uruguay for Human Consumption and Irrigation by Alvareda E., Ramos J., Abelenda E. and Gamazo P..*

Abstract: Groundwater is one of the major natural sources of drinking water and irrigation supply of the North of Uruguay. People from this region drink groundwater without previous treatment resulting in several health problems (i.e.: gastroenteritis) caused by the interference of sewage from septic tank infiltration. One of the main concerns is that there are no data from metalloid's distribution and therefore also no epidemiological studies in Uruguay associated with environmental exposure on geogenic metals or metalloids as arsenic, or contaminants from agriculture or seepage into aquifers from septic tanks.

Since the last two years an interdisciplinary group from Water Department from the North region of the University of the Republic (UdelaR) in the framework of the Project "Towards an Integrated Management of Water Resources in Highly Anthropized Hydrological Systems: Arroyo San Antonio - Salto / Arapey Aquifer" (funded by the National Agency for Research and Innovation (ANII)/María Viñas) has been collected relevant data was of groundwater in South-western Uruguay with the aim of evaluating the natural baseline of ions and metalloids in hydrogeology formations.

Results from 20 groundwater wells monitored biannual shown Arsenic (4.0 - 49.3 ug/L), Zinc (15.4 - 396.0 ug/L), Cr (3.1 ug/L only one well), phenols (0.01 - 0.05 mg/L), Total Phosphorous (50.0 - 178.5 ug/L), pH (6.56 - 8.13), ORP (58 - 501 mV), Electrical conductivity (217.8 - 710.9 uS/cm), Dissolved Oxygen (6.16 - 11.14 mg/L), nitrate (12.7 - 168.5 mg/L), bicarbonate (48.6 - 407.3 mg/L CaCO₃), Hardness (62.5 - 793.5 mg/L) and presence of Fecal coliforms in the 50% of the wells.

Relevant information is being generated towards the characterization and baseline groundwater, the presence of metals and metalloids and their possible effects on human health.

3. Lists of any meetings/conferences/workshops attended by your Local Chapter members and of any certificates, prizes etc awarded to your Chapter or Chapter members;

- Alvareda E., Ramos J., Abelenda E. and Gamazo P., “Preliminary groundwater hydrochemistry studies from Salto Northwest Uruguay as drinking water and their possible effects in human health” awarded as the BEST POSTER in MEDGEO 2019 Guiyang, China Aug 2019 .
<http://www.medgeo2019.com/>



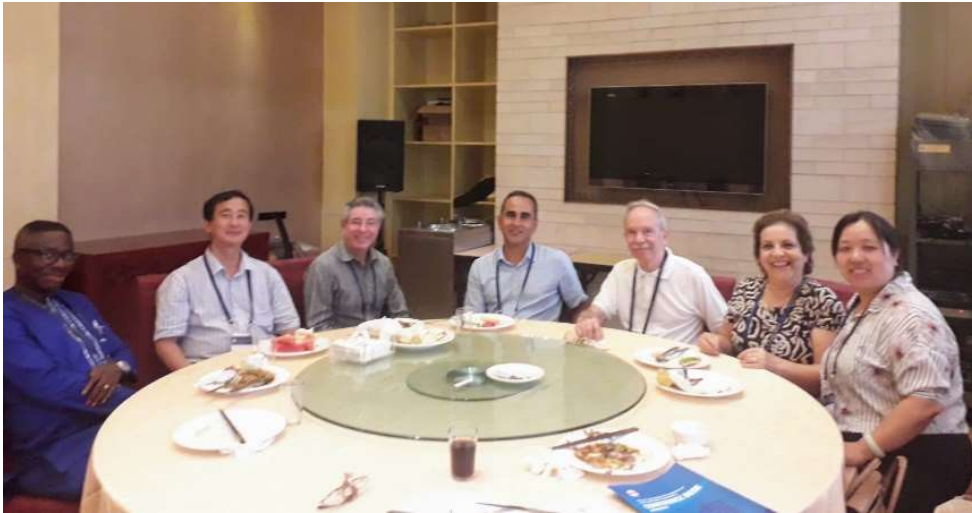
Prof. Elena Alvareda, PhD receiving her BestPoster Prize at MEDGEO 2019

- Mañay N; Buhl, V, Caceres M. “Medical Geology approach for Arsenic studies in Uruguay: advantages and difficulties”. MEDGEO 2019 Guiyang, China Aug 2019
<http://www.medgeo2019.com/>



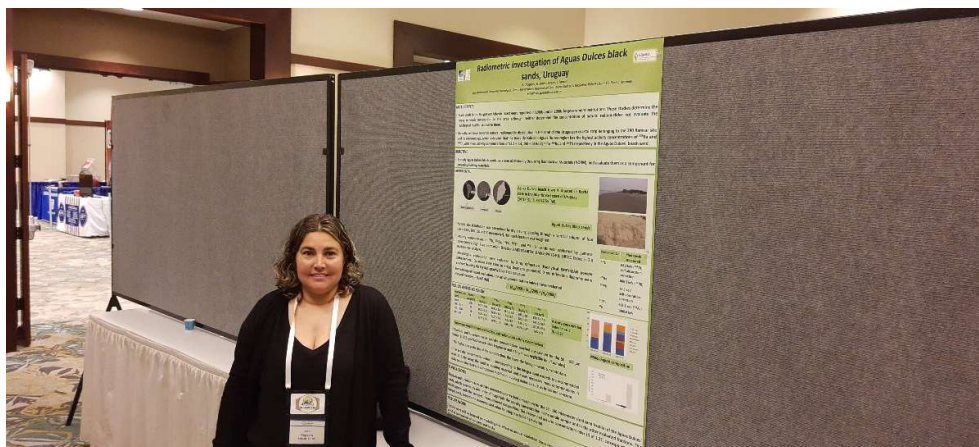
Prof. Nelly Mañay, PhD at MEDGEO, 2019

- Mañay, N. “New trends in improving the environment and human health issues, through a collaborative multidisciplinary approach. Examples in Uruguay” The 11th International Symposium on Environmental Geochemistry - ISEG 2019. Beijing, China Aug.2019
webuse.pku.edu.cn/iseg2019



Prof. Nelly Mañay, PhD at ISEG 2019

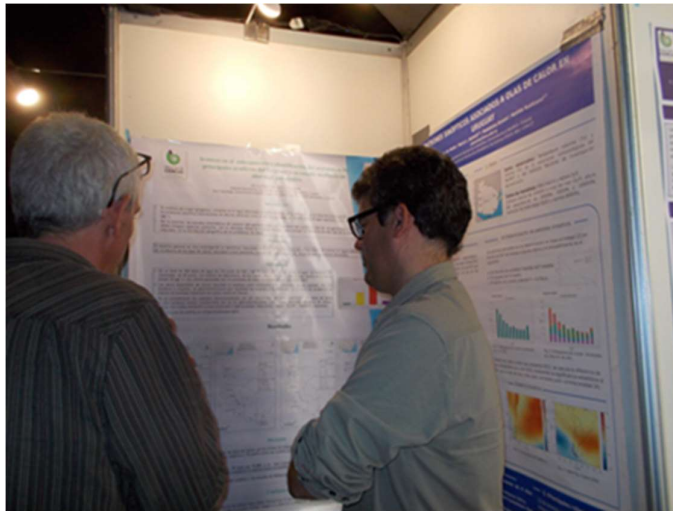
- “Radiometric investigation of the Aguas Dulces black sands, Uruguay”, A.Noguera, H. Bentos Pereira, L. Fornaro, “the Ninth International Symposium on Naturally Occurring Radioactive Material, NORM IX”, 23 al 27 de setiembre de 2019, Denver, Colorado, Estados Unidos.
<https://www.iaea.org/events/50434>
- “Natural and anthropogenic radionuclides concentrations in Baccharis articulata from Briozzo Lagoon, Uruguay”, A.Noguera – C. Bañobre - H. Bentos Pereira – L. Fornaro, “18th International Symposium on “IN SituNUclearMETrology as a tool for radioecology – INSINUME 2019”, 23 al 26 de abril de 2019, Kusadasi, Turquía. <http://insinume2019.com/>



Prof. Analía Noguera, PhD at NORM IX, USA

- Mariano Cáceres Happel; Nelly Mañay. “Relevamiento e identificación del arsénico en los principales acuíferos del Uruguay y su estudio mediante un abordaje geo-médico. X Jornada de Geociencias”, Marzo 2019. Montevideo, Uruguay.

Title (translated from Spanish) : “Study of the geoenvironmental risk due to the presence of arsenic in the main aquifers of Uruguay and its implications in human health from a geomedical approach”,



Mariano Cáceres, Geologist & Master Student in X Geosciences Conference, Montevideo, Uruguay

- Valery Bühl, Paulina Pizzorno, Lucía Falchi, Florencia Cora Jofré, Marianela Savio, Mariela Pistón. Arsenic determination in urine samples using HG-MIP-OES: A toxicological application. 15th Rio atomic Spectrometry. 6-12 October 2019, Mendoza, Argentine.
<https://www.15riosymposium.com/>



Prof. Valery Bühl, PhD in 15th Rio Symposium on atomic Spectrometry

- Collazo, P., Mañay, N., Pamoukaghlián, K. AsURU: “Arsénico en agua subterránea de Uruguay y riesgos a la salud asociados: avances y dificultades en su gestión” IX Congreso Uruguayo de Geología, Flores, Uruguay <http://congresogeologia.uy/programa/>

Title (translated from Spanish) AsURU project: Arsenic in groundwater in Uruguay and associated health risks: advances and difficulties in its management



Prof. Karina Pamoukaghlián, PhD in IX SUG 2019

4. Copies of any Local Chapter newsletters that you have produced; information on any Local Chapter web-site that you have set-up. Not reports available this year

5. Others

- Prof. Ana Lía Noguera was the IMGA webinar invited speaker with a conference titled “Natural radioactive contamination and doses in Rocha’s coastal ecosystem, Uruguay held in may 5th 2019.
- Prof. Mañay in her role of IMGA past president and current “audit committee chair” participated in many activities related to the IMGA management including the presentation, in the General Assembly, of the promotion the materials for the next 9° MEDGEO to be held in Spain on behalf of Elena Gimenez Foncada, current co-chair of IMGA.