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THE LASER REVOLUTION IN THE HYDROGEOLOGY GROUP IN MAR DEL PLATA, ARGENTINA

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Abstract: The Hydrogeology Group of the National university of Mar del Plata, Argentina, has about 30 years of existence, but since 2008 its activities were strongly improved by the donation from IAEA of a laser spectroscopy Los Gatos research DLT-100. The Group, without any previous experience in Mass Spectrometry (MS) analysis, has produced 3000 results of stable isotope in water, which leads to an important academic production. The capabilities of the group for analyzing and understanding the hydrological cycle in the Pampa Argentina environment was increased producing a revolution in the conceptualizing of the systems in the Pampa plain.

1. INTRODUCTION

The Hydrogeology Group in the University of Mar del Plata, Argentina, was formed in 1985 and during more than twenty years the research lines were Groundwater Flow Modeling, Environmental Hydrogeology and Hydrogeochemistry. In year 2004 thanks to the possibility to participate in its first Research Coordinated Project (CRP) the group started to be involved in isotopic projects with the IAEA, working in cooperation with the National Institute of Geochronology and Isotope Geology (INGEIS), a Institute with a large trajectory in the subject. In the year 2008 the Group received as a donation of the IAEA into an ARCAL project a Laser Spectroscopy Los Gatos Research DLT-100.

2. METHODS

The Laser Spectroscopy was installed in a Laboratory space (Figure 1) specially disposed by the University, and in 2008 Orlando Mauricio Quiroz Londoño PhD was trained in Vienna for the laser machine operation. The laser spectroscopy is being operated by the authors and the results are available on line in a database designed by Quiroz Londoño (http://www.mdp.edu.ar/hidrogeologia /BDusuariosexternos/index.php). Starting from the standards provided with the machine, five internal standards were developed for the team (Table 1)

Table 1. Internal Standards used for the Hydrogeology Group in Mar del Plata, Argentina.

Standard	Water origin	$\delta^{2}H$	$\delta^{18}O$
A	Correntoso Lake (Patagonia)	-59.9	-8.64
B	Groundwater from Lobería city	-25.7	-4.78
C	Mixing of Mar del Plata groundwater and La Salada lake water	-31.8	-5.46
D	Water from a creek in the Andes in Mendoza at 3000 masl.	-111.0	-15.8
E	Distilled water of La Brava lake	-2.2	-0.07

Figure 1. Los Gatos research DLT-100 installation at the University of Mar del Plata, Argentina.

3. RESULTS

At present 3390 samples has been analyzed for $\delta^{2}H$ and $\delta^{18}O$ (Figure 2). The results allowed the Research Team to achieve the following achievements:

- Participation in five CRPs.
- Five PhD Thesis were successfully finalized including isotopic date provided by the isotope Hydrology laboratory of the Group.
- Seven papers based on the isotope data have published in indexed journals (ISI) since 2008, and other four are under consideration.
- More than twenty Congress presentations using stable isotope data.
- Cooperation with other research groups and Governmental Organizations.
- Sustainability of a monitoring program in the Quequen Grande River, including stable isotope analyses of weekly samples of river water from two sites during the last ten years and continuing.

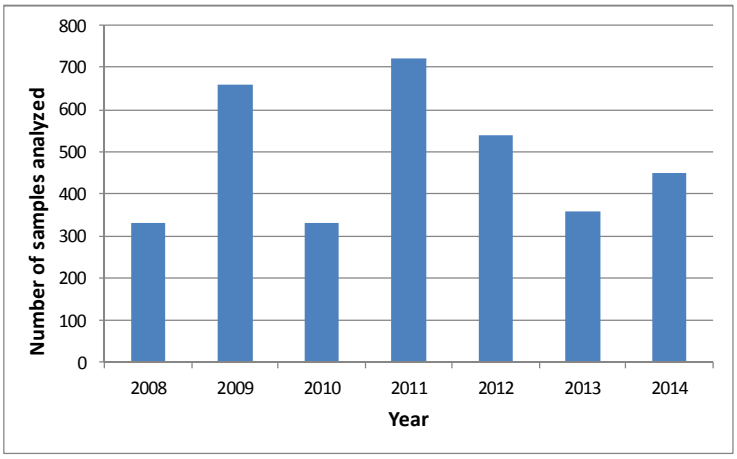

Figure 2. Number of samples analyzed for the hydrogeology group of Mar Del Plata National University.

- Participation in a Fourth interlaboratory comparison exercise for δ^2H and $\delta^{18}O$ analysis of water samples (WICO2011)
- Four stable isotopes in precipitation gages are operating giving information and local meteoric water lines for the southeast of the Buenos Aires province.
- Training in the used of laser spectroscopy to visitors from Ecuador, Colombia and South Africa.

4. CONCLUSIONS

Laser spectroscopy introduced a real revolution in the development of the hydrogeological research in Mar del Plata, Argentina. A small group without any experience in laboratory or mass spectrometry became able to produce water stable isotope data; increasing its capabilities and giving the chance of introduce new conceptual criteria for solving hydrological problems in the region. PhD thesis approved, new young researchers incorporated, scientific projects granted by national agencies, a large increase in the scientific productivity expressed as papers in indexed journals, etc. arises as a consequence of the possibility of generate isotope data.

The advantages of laser spectroscopy transformed the hydrogeologic research in the Mar del Plata' s group and also other groups in Argentina that can now access to isotope, giving to the society new ideas, possibilities and elements to solve hydrologic problems in Argentina.