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Geochemical monitoring in the Hontomín (Burgos, Spain) injection site: preliminary results and perspectives.

Barbara Nisi (1), Javier de Elío (2,3), Orlando Vaselli (4,5), Franco Tassi (4,5), Fidel Grandia (6), and Luis Felipe Mazadiego (2)

(1) CNR-IGG Institute of Geosciences and Earth Resources, Pisa, Italy (b.nisi@igg.cnr.it), (2) ETS Ingenieros de Minas Universidad Politécnica de Madrid, Madrid, Spain (javielio@qyc.upm.es) (luisfelipe.mazadiego@upm.es), (3) Ciudad de la Energia, Ponferrada, Leon, Spain, (4) Department of Earth Sciences, Florence, Italy (orlando.vaselli@unifi.it) (franco.tassi@unifi.it), (5) CNR-IGG Institute of Geosciences and Earth Resources, Florence, Italy , (6) AMPHOS21,Barcelona, Spain (fidel.grandia@amphos21.com)

CO2 capture and storage (CCS) projects are presently developed to reduce the emission of anthropogenic CO2 into the atmosphere. CCS technologies are expected to account for the 20% of the CO2 reduction by 2050. One of the main concerns of CCS is whether CO2 may remain confined within the geological formation into which it is injected since post-injection CO2 migration in the time scale of years, decades and centuries is not well understood. Theoretically, CO2 can be retained at depth i) as a supercritical fluid (physical trapping), ii) as a fluid slowly migrating in an aquifer due to long flow path (hydrodynamic trapping), iii) dissolved into ground waters (solubility trapping) and iv) precipitated secondary carbonates. Carbon dioxide will be injected in the near future (2012) at Hontomín (Burgos, Spain) in the frame of the Compostilla EEPR project, led by the Fundación Ciudad de la Energía (CIUDEN). In order to detect leakage in the operational stage, a pre-injection geochemical baseline is presently being developed. In this work a geochemical monitoring design is presented to provide information about the feasibility of CO2 storage at depth.

The Hontomín area (30 km N from Burgos) is located in the north-central region of the Iberian Peninsula, where the NE region of the Duero Basin is bordered by the Basque-Cantabrian Range to the north and the Iberian Range to SE. Paleozoic metasediments are the basement formations and are discordantly overlain by Alpine cycle rocks, which consist of Triassic, Jurassic and Cretaceous sedimentary formations. The Neogene sedimentation in the Duero Basin is represented by fluvial deposits. The Basque-Cantabrian basin is considered one of the most prospective sedimentary basins in Spain. In terms of hydrocarbon exploration, the most attractive aspect is the presence of a large variety of source rocks, reservoirs and seals and the abundant structural and stratigraphic traps. In the surrounding areas of the Hontomín site, oil and gas production has been carried out onshore (Ayoluengo and Castillo gas fields) and offshore (Gaviota and Albatros gas fields). Moreover, a number of non-commercial oil discoveries are reported at Huidobro, Tozo and Hontomín. With these concepts in mind, the geochemical monitoring in this site has been addressed to those phases that may act as carriers of the injected CO2, such waters and geo-gases.

Several geochemical and physical activities are presently in progress in the Hontomín area, as follows: a) geochemical study of running- and ground-waters; b) large- to small-scale surveys of diffuse soil CO2 gas flux; c) small-scale surveys of diffuse VOC (Volatile Organic Compounds, e.g. methane, benzene) flux from soil carried out with static and accumulation chamber methods; d) thermal imaging by ultra-light vehicle equipped thermocamera; e) soil radon flux.

The geochemical data indicate that the water samples are mainly related to surface aquifers, being characterized by low salinity and low concentrations of dissolved (biogenic related) CO2. This is consistent with the low measured soil CO2 fluxes, i.e. between 4.9 to 11 g•m-2•d-1, and the absence of CH4 emission. This suggests that CO2 leakage should easily be detected if it would occur in the reservoir. Once the CO2 injection will be operative, permanent stations for the measurements of CO2 diffuse flux are planned to be carried out, along with semi-continuous (every 30 minutes) gas-chromatographic analysis of fluids from the oil wells present in the area. Periodic sampling and analysis of deep waters may allow the understanding of the physical-chemical processes regulating CO2 trapping.