From CO_2 geothermal emissions to commercial material in the framework of the H2020 GECO project: What we can learn from the Ligurian ophiolites.

C. BOSCHI, A. RIELLI, A. DINI, I. BANESCHI, G. GOLA, G. MONTEGROSSI, A. ORLANDO, G. RUGGIERI, E. TRUMPY

Istituto di Geoscienze e Georisorse, CNR, Italy.

The goal of the GECO (Geothermal emission gas control) project is to advance our ability to provide cleaner, and cost-effective non-carbon emitting geothermal energy. GECO is based on the application of an innovative technology that can limit the emissions from geothermal plants by condensing and re-injecting gases or utilising them to produce commercial products. This approach leads to long-term environmentally friendly storage of waste gases and lowers the cost of cleaning geothermal gas compared to standard industry solutions.

We are primarily focused on implementing a new *ex-situ* CO_2 mineral sequestration approach for the production of commercial materials. Because the efficiency of the carbonation process is intimately linked to the mineralogy of the starting material, the first step has been to perform a regional survey to identify the most reactive ultramafic lithology to accelerate the CO_2 fixation process. We have found that in Southern Tuscany natural carbonation has been particularly efficient in the formation of magnesite and hydromagnesite when CO_2-bearing fluids interacted respectively with serpentinised harzburgites and dunites [1, 2]. Therefore, these lithologies will be first characterised petrologically and geochemically and then used to perform carbonation experiments to constrain silicate dissolution and carbonation precipitation rates. Results will be used to model reaction paths for industrial applications in order to create a variety of potential commercial materials. This research received funding from the European Union's Horizon2020 Research and Innovation Program under grant agreement No 818169 (Project GECO).

[1] Boschi C., Dini A., Dallai L., Ruggeri G., Giannelli G., 2009. Enhanced CO_2-mineral sequestration by cyclic hydraulic fracturing and Si-rich fluid infiltration into serpentinites at Malentrata (Tuscany, Italy), Chemical Geology, 265, 209-226.

[2] Boschi C., Dini A., Baneschi I., Bedini F., Perchiazzi N., Cavallo A., 2017. Brucite-driven CO2 uptake in serpentinized dunites (Ligurian Ophiolites, Montecastelli, Tuscany), Lithos, 289,264–281.