



Curriculum: CU1 - Earth Systems and the Environment

Enhanced weathering as a climate solution: modeling and field aspects

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Host University/Institute: Università degli studi di Palermo / Ingegneria

Research Keywords: Carbon sequestration

Climate solutions

Enhanced weathering

Reference ERCs: PE10_9 Biogeochemistry, biogeochemical cycles, environmental chemistry

PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution

PE10_21 Earth system modelling and interactions

Reference SDGs: GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

Among the strategies to combat climate change, one of the most promising is Enhanced Weathering (EW), which aims to sequester atmospheric CO₂ by increasing the rates of naturally occurring chemical reactions in soils, using highly reactive minerals (i.e., silicates). Reacting with CO₂, silicate minerals may lead to the increase in the alkalinity of soil water and the formation of dissolved bicarbonate and carbonate ions, that if are leached out of the soil, transported by groundwater, and eventually reach the oceans, form the carbon sequestration. From the experimental point of view, only some mesocosm or pilot-scale experiments of EW exist and are conducted in controlled conditions. Existing models, instead, allow to quantify the impact of hydroclimatic fluctuations, or soil and vegetation parameters on the involved biogeochemical processes. Applying for this research project, the candidate may be involved in modeling EW process. The candidate may help improving one of the most complete models existing in literature about EW, which already provides reliable carbon sequestration estimations, as compared to the recently published mesocosm experiments. The candidate may interface with several research groups that are conducting laboratory experiments on soil plots and calibrate/validate the model with their data. The candidate can also carry out an extensive application of the model to simulate EW yields at the global scale.

Research team and environment



The research activity will be held at the University of Palermo and will be coordinated by Prof. Leonardo V. Noto, full professor of hydrology. His expertise ranges from hydrological modeling, ecohydrology, to climate change aspects. The team is also composed of some researchers, post-doc, and Ph.D. students with great experience in the above-mentioned topics. Particularly, Dr. Giuseppe Cipolla, has a strong experience on modeling enhanced weathering processes for carbon sequestration, cooperating with Prof. A. Porporato (Princeton Univ.), and Dr. S. Calabrese (Texas A and M Univ.). The candidate will thus find an enthusiastic team to carry on working on the modeling aspects of this technology.

Suggested skills for this research topic

The candidate will need to have some knowledge about hydrological processes and biogeochemistry. Other required skills regard the knowledge of the mostly known programming languages, such as Python, Matlab, and the software QGIS.

Source of fundings

Host University's fundings

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Internship

For this scholarship it is not planned a period of intership
