

PRESS RELEASE

When Carbon meets Iron in soils

Neuchâtel, 13 January 2025. The carbon cycle is a key factor in the greenhouse effect that causes climate change, yet it holds many mysteries. Particularly when it comes to the role of iron minerals found in soils. To find out more, environmental chemistry professor Laurel ThomasArrigo has been awarded a Starting Grant from the Swiss National Science Foundation (SNSF). Thanks to this Starting Grant, the researcher and her team will study how iron-containing minerals influence carbon cycling in soils, shedding new light on the role of soil and soil its mineral phases for climate change.

Soils and sediments are precious reservoirs of carbon, an element whose transformation into carbon dioxide (CO₂) or methane (CH₄) are two major causes of the greenhouse effect. But there are still many grey areas concerning the biogeochemical processes controlling these transformations, and in particular the interactions of carbon with iron-containing soil minerals.

“Until now, the link between iron mineral transformations, such as oxidation and reduction, and their impact on carbon dynamics has mainly been studied in the laboratory”, notes Laurel ThomasArrigo. In situ studies in soils are still rare and concentrated on a few common minerals, such as ferrihydrite and goethite. Therefore, scientists do not know to what extent climate change will impact the stabilization or mobilization of mineral-associated organic carbon in soils. The MIMOC (Mineral-Mediated Organic Carbon dynamics in soils and sediments) project will enable new experimental approaches to be developed in this area, and on three observation sites: volcanic soils, coastal soils and wetlands.

Carbon reservoirs

Volcanic soils are characterized by excellent organic carbon storage capacities, more so than in other soil types. This is partly due to the abundance of reactive iron minerals, typical of these soils. These minerals have large surface areas that stabilize organic carbon, preventing its degradation. “Hence our previous work in volcanic regions such as Iceland, where we have been studying the interactions between iron and carbon since 2019, will provide valuable knowledge to the MIMOC project.”

The SNSF support will help improve the understanding of the causes of greenhouse gas emissions from soils, an information which is critical to developing strategies to limit the effects of climate change. It will also help to identify the environmental factors influencing the stability of iron-containing minerals, as well as the conditions under which they transform. Laurel ThomasArrigo and her team will also be able to deduce the impact of water table fluctuations on carbon availability, an essential element in the agricultural sector. The grant runs from 2025-2030. It will be used to fund three doctoral theses and one post-doctoral position.

More about Laurel ThomasArrigo :

<https://www.unine.ch/sciences/biographie/laurel-thomas-arrigo>

<https://www.unine.ch/envchem/>

Interview in French in the series « Professeur-e sous la loupe »

<https://www.unine.ch/newsroom/actualite/la-science-pour-relever-les-defis-environnementaux>

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