EGU2020-11036, updated on 27 Feb 2021
https://doi.org/10.5194/egusphere-egu2020-11036
EGU General Assembly 2020

Soil Organic Matter stability along altitudinal gradients in the French Alps

Jérôme Poulenard[1], Norine Khedim[1,2], Lauric Cecillon[3,4], Amélie Sailard[2], Pierre Barré[4], Laure Soucémarianadin[4], François Baudin[5], Philippe Choler[2], and Wilfried Thuiller[2]

[1]Université Grenoble Alpes, Université Savoie Mont Blanc, CNRS, EDYTEM, 73000, Chambéry, France
[2]Université Grenoble Alpes, Université Savoie Mont Blanc, CNRS, LECA, 38000, Grenoble, France
[3]Normandie Univ, UNIROUEN, INRAE, ECODIV, 76000 Rouen, France
[4]Laboratoire de Géologie, PSL Research University, CNRS-ENS UMR 8538, Ecole Normale Supérieure, Paris, France
[5]Sorbonne Université/CNRS, UMR ISTeP, Paris, France

High-elevation ecosystems are considered as systems that have accumulated large amounts of organic carbon in their soils over the past millennia. However, there are still large uncertainties about soil organic matter (SOM) stocks and stability in mountain areas . The fate of SOM in alpine environments is particularly questioned in the context of climate change.

The aim of this study was to investigate SOM stocks and biogeochemical characteristics of SOM along altitudinal gradients to decipher their climatic and biogeochemical drivers. To do so, we used the soil samples set of the French ORCHAMP long-term observatory network. ORCHAMP is built around multiple altitudinal gradients (ca. 1000m of elevation gain representative of the pedoclimatic variability of the French Alps. Each gradient is made of 5 to 8 permanent plots distributed regularly each 200 m of elevation, from the valley (1000 m a.s.l.) to the mountain top (until 3000 m a.s.l.). We studied 18 elevational gradients, including 105 soil profiles and 350 soil horizons. The biogeochemical stability of SOM was estimated with Rock-Eval® thermal analysis.

SOM stocks are extremely variable and do not increase with elevation . The size of the thermally labile SOM pool strongly increases with elevation. The high lability of SOM revealed by Rock-Eval® thermal analysis suggests a generally high vulnerability of SOM to climate change in alpine environments. The mechanisms explaining the maintenance of this SOM pool in alpine environments are still under study. Hypotheses involving complex balances between climate, nature of fresh organic matter, and enzymatic activities will be discussed.