Soil Carbon in the Ecological Transition
International symposium
24 - 26 January 2024

Quantification and characterisation of soil carbon at different scales.

Tiphaine CHEVALLIER

Eco&Sols, IRD, CIRAD, INRAE, L'institut Agro, University of Montpellier, Montpellier, France

Soil carbon (C), essentially soil organic carbon (SOC), is a common indicator to monitor soil health. Soil ecosystem services (e.g. food production, water retention and filtration, biodiversity habitats) are mainly supported by soil organic matter stocks and fluxes. Soils have also a potential to mitigate climate change by storing C. However, measuring carbon stocks and evaluating its evolution with time needs different assumptions to be representative to a geographical area and eventually to a specific soil function. Soil C is found in several forms (e.g. organic, microbial or plant derived SOC, inorganic C) and reactivity (e.g. SOC labile and SOC resistant). These different pools of C with different turn over affect and are indicators of different soil functions. For instance, the labile SOC stocks are indicators of plant nutrients recycling whereas resistant SOC stocks are indicators of the soil climate change mitigation role. There is thus a need to be able to quantify and characterise the soil carbon at different scales.

Global C stocks, C fluxes and C pools are directly measured or indirectly measured with different technics. Various extrapolation models, extrapolation in time, in space, or even both, are calibrated and validated on field measured data. National and international efforts are made to harmonize the soil analysis and to develop large soil health monitoring. However, in addition to logistical headwinds (field/site accessibility, equipment accessibility and maintenance, technical human resources, management of soil sample archives), there are still some methodological challenges to produce satisfactory soil C data and soil C pools in every kind of soil types. Calcareous soil are especially less studied. Characterizing soil carbon stocks, pools and fluxes are especially difficult in these soils, although 30% of soils are calcareous. Support technical capacity building and methodological research in C measurements to supply quality data are still needed. Especially, there is an urgent need to fix and harmonize methodological technics to quantify and characterize soil carbon in calcareous soils.