Soil pore network structure:
A new controlling mechanism of tillage effects on soil organic carbon mineralization?

Context:

Tillage has long been recognized as a primary agricultural practice that accelerates the decomposition of soil organic carbon, contributing to climate change. This microbial-driven decomposition can be attributed to various mechanisms. However, the role of soil pore architecture as a key determinant of soil organic carbon decomposition has surprisingly received limited attention. It is reasonable to assume that tillage intensity may influence the habitat (i.e., pore network structure) in which microbes operate, as well as gas and water flow, thus introducing a novel and understudied factor in the control of soil organic carbon stabilization.

Goals:

The student will contribute to sampling a wide spectrum of both young and highly weathered topsoils and subsoils subjected to varying levels of tillage intensity across Europe and Africa. The student will employ the water retention curve technique to assess the distribution of pore neck sizes among different tillage treatments and soil types. Additionally, the thesis will include training in X-Ray µCT reconstruction and analysis, facilitating the generation of 3D images and the derivation of pore metrics such as pore connectivity and pore tortuosity. Finally, the insights gained from these techniques will be integrated with data on soil organic carbon stabilization.

Knowledge and skills required:

Affinity for soil biogeochemistry and soil physics.
Good organisation skills, ability to engage with a complex dataset.
Enthusiasm for soil sampling and soil lab analyses.
Reasonable proficiency with written English.
Willingness to participate in the scientific publication process.

Collaboration: This project will be co-supervised by Orly Mendoza (orly.mendoza@unil.ch), Stephanie Grand (stephanie.grand@unil.ch) and Meret Aeppli (meret.aeppli@epfl.ch)

Working place: Géopolis (UNIL Lausanne) and ALPOLE (Sion)