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Focus on Soils and Water Graduate School

Soil systems:

Integrating chemical and biophysical interfaces in soils

Course code: P000134
3 credits

SOIL SYSTEMS

Soil scientists are integrating interdisciplinary research into a holistic soil system view, recognizing it as a complex, adaptive, and structured system with macroscopic properties and processes dependent on smaller spatial scale interactions.

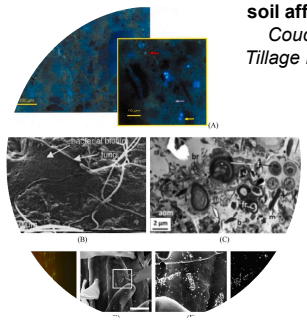
THE STUDY OF SOIL INTERFACES AND SOIL FUNCTIONS

Modern technologies such as X-ray tomography, XANES spectroscopy, planar optode imaging systems; *in situ* microsensors, hydrogel beads and microfluidic chips have transformed our understanding of small-scale soil interactions, enabling visualization, quantification, and spatial analysis of soil components, interfaces and functions. At the same time, new knowledge about microscale processes is shaping how we manage soils.

We invite students working in all disciplines relevant to the study of soils to participate in this course taught by an international group of researchers working at the cutting edge of soil systems.

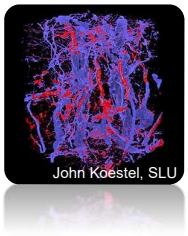
Schedule

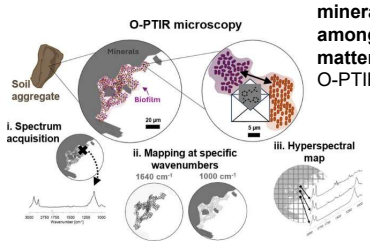
1) Literature group meetings: 3rd, 10th and 17th Nov. 2025
2) A workshop held at Ultuna with participation of international leading scientists in this research area: 24th-28th Nov. 2025
3) Student oral or poster presentations: 2nd Dec. 2025



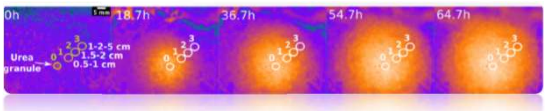
Why do we need to look at microbes in their microhabitat? *Védère et al., Soil Biology and Biochemistry (174), 2022*

How does the air/water distribution in structured soil affect CO2 emissions? *Coucheney et al., Soil and Tillage Research (248), 2025*

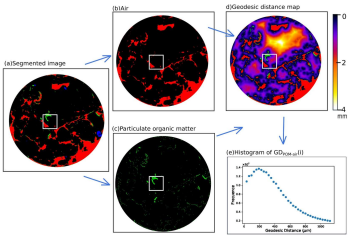




How does the visualization of organo-mineral structure help unravel interactions among microbes, minerals and organic matter?
O-PTIR microscopy: *Jamoteau et al. EST 2025*

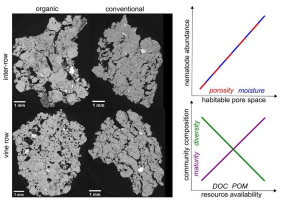


How does microscale variation in ammonia availability affect pH and ammonia oxidizer activity? *Merl et al. SBB 2024*



How does the distance from POM to air-filled pores affects N_2O emissions?
Ortega-Ramírez et al., Geoderma (429), 2023

How does soil management affect trophic interactions? *Schlüter, S. et al Applied Soil Ecology (170), 2022*



Aim

- What does that mean and why does it matter to study soils as complex, adaptive and structured systems?
- What opportunities and challenges do recent micro-analytical methods give for understanding chemical and biophysical interactions in soils?
- How to use these approaches to inform larger scale soil management, policy and decision making?

International invited speakers: Claire Chenu (INRAe, France), Naoise Nunan (CNRS, France), Steffen Schlüter (UFZ, Leipzig), Marco Keiluweit (University of Lausanne, Switzerland) and Seeta Sistla (CalPoly University, California, USA) & **SLU teachers**: Anke Herrmann, Nick Jarvis, Sara Hallin, Jon-Petter Gustafsson, Mats Larsbo, Grace Pold, Pascal Benard and Elsa Coucheney

Registration to elsa.coucheney@slu.se with your name and affiliation

Deadline 30th September 2025

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SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE