



# STAIR PhD Course May 31 – June 4, 2010

## *Organic matter turnover and stabilization in soil - concepts and implications for soil fertility, environmental loads and climate change*

Volume: 5 ETCS

Location: Technical University of Denmark, Risø National Laboratory for Sustainable Energy, Roskilde, Denmark.

**Course content:** The course aims to provide a knowledge platform for understanding how soil organic carbon (SOC) links to soil quality, how SOC is influenced by land use and soil management, and how changes in SOC are interlinked with climate change. The framing of this platform is that SOC plays a key role in ecosystem functioning. Lectures will cover concepts of organic matter structure, function, turnover and stabilization, the impact of agricultural practices and land use on SOC, the soil physical and biological processes driving organic matter mineralization, and modeling of the SOC cycle. The complex relationship between SOC and climate change will be highlighted. The course offers practical experience in using state-of-the-art methods for studying SOC dynamics including the identification of key microbial processes by analysis of  $^{13}\text{C}$ -fatty acid biomarkers. Samples for the experimental work will be provided from on-going  $^{13}\text{CO}_2$ -pulse labeling investigations at contrasting land use systems. Course participants will also present and discuss key papers and their own projects.

**Key teachers:** Dr Eric Paterson, The Macaulay Land Use Research Institute, Aberdeen; Docent Sophie Zechmeister-Boltenstern, The Research and Training Centre for Forests, Natural Hazards and Landscape, Vienna; Professor Georg Guggenberger, University of Hannover; Professor Bent Tolstrup Christensen, Aarhus University; Professor Per Ambus and Professor Iver Jakobsen, Technical University of Denmark; Professor Lars Stoumann Jensen, Copenhagen University.

Further information and online registration: [www.stair.agrproject.dk](http://www.stair.agrproject.dk)

**Course outline:** The course will provide a state-of-the-art overview on soil carbon fluxes and pools. Particular attention will be paid to methods which can link microbial community composition and diversity to functions and thereby overcome our current 'black box understanding' of the soil microbial biomass. Effects of land use and management on soil carbon balance will be highlighted in terms of soil quality, carbon sequestration and climate change mitigation. The course will be a mix of lectures, practical exercises and seminars where students present their own projects.

**Program:**

**Morning lecture sessions:**

Monday 31 May

- Soil organic carbon; past and present concepts in relation to soil fertility and ecosystem functioning
- The carbon cycle; global, terrestrial and drivers of decomposition processes

Tuesday 1 June

- Soil microbial communities; qualitative and quantitative aspects; metagenomics
- Isotope methods to quantify carbon fluxes in soil; resolving the role of microbial biomass components

Wednesday 2 June

- Characterization of pools of soil organic carbon; species, aggregates, stability
- Climate change and soil carbon balance

Thursday 3 June

- Land use effects on soil carbon balance
- Land management effects on soil carbon balance

Friday 4 June

- Models for carbon cycling in soils; arable, grassland, forest
- Carbon models at ecosystem level

**Afternoons with practical exercises** within the themes:

- $^{13}\text{C}$  field labeling methods
- Automated in situ respiration methods
- Extraction and analysis of biomarker fatty acids
- Methods for estimation microbial biomass
- Modeling

**Evenings** will be devoted to student presentations of their own project posters

**Student preparations 24-28 May:**

- Preparation of poster describing own PhD project
- Reading notes and papers distributed well ahead of the course

**Target group:**

PhD students within soil biology, microbial ecology, soil science, agronomy, environmental sciences. Number of participants is limited to 25

**Time and place:**

31 May to 4 June 2010

Technical University of Denmark, Risø National Laboratory for Sustainable Energy, Biosystems Division, Roskilde, Denmark [www.risoe.dtu.dk](http://www.risoe.dtu.dk)

**Organizers:**

Iver Jakobsen, Risø DTU [ivja@risoe.dtu.dk](mailto:ivja@risoe.dtu.dk)

Bent Tolstrup Christensen, University of Aarhus [Bent.T.Christensen@agrsci.dk](mailto:Bent.T.Christensen@agrsci.dk)

**Work load and credit points**

Approximately 125 hours in total including the lectures, exercises and seminars during the course and poster preparation and article reading before the course. The workload corresponds to 5 ECTS.

**Admission**

Applicants are requested to submit the registration form no later than 1 April 2010. Information on admission to the course will be forwarded shortly after. PhD students will have priority, but depending on number of registrants we also welcome MSc students and post graduates.

**Course fee:**

The course fee is 2800 DKK (~375 EURO). This covers course material, housing, meals and social events.

**Accommodation:**

Accommodation will be at [www.danhostel.dk/Roskilde](http://www.danhostel.dk/Roskilde); suggested arrival: Sunday 30 May 2010 before 18:00

Public bus transport between hostel and Risø DTU

**Further information:**

Please contact Iver Jakobsen [ivja@risoe.dtu.dk](mailto:ivja@risoe.dtu.dk)