Geophysical Research Abstracts
Vol. 16, EGU2014-14225, 2014
EGU General Assembly 2014

Impact of Nitrogen Fertilization on Soil Organic Matter in Forest Soils (INFOSOM)

Stefan J. Forstner (1), Michael Tatzber (1), Katharina M. Keiblinger (1), Patrick Schleppi (2), Frank Hagedorn (2), Per Gundersen (3), Wolfgang Wanek (4), Martin Gerzabek (1), and Sohpie Zechmeister-Boltenstern (1)

(1) Department of Forest and Soil Sciences, University of Natural Resources and Life Sciences, Vienna, (2) Research Unit Forest Soils and Biogeochemistry, Swiss Federal Institute for Forest, Snow and Landscape Research, (3) Department of Geosciences and Natural Resources Managment, University of Copenhagen, (4) Department of Microbiology and Ecosystem Research, University of Vienna

Anthropogenic induced nitrogen (N) deposition has been reported to increase carbon (C) storage in boreal forest soils. However, it is unclear if this also applies to temperate forests where primary production, and hence C inputs to soil, are less limited by N. Likewise, litter decomposition and soil organic matter (SOM) stabilization have been shown to be affected by N inputs, although the exact mechanisms remain unclear. A major obstacle in assessing the net effect of increased N availability on soil C budgets is our limited understanding of the response of soil microorganisms and how this may feedback on SOM stabilization in the long run.

To collectively address these questions we make use of two long-time forest N-addition experiments from Klosterhede, Denmark and Alptal, Switzerland which received 50-55 and 25 kg N ha-1 year-1, respectively, for over 20 years. At both sites 15N tracer has been applied with the N-addition treatment enabling isotope-specific analysis. Stands are dominated by Norway spruce (Picea abies) but differ in site characteristics such as soil type, elevation, and mean annual temperature.

We investigate the effect of N addition on SOM quantity, quality and depth-distribution using state-of-the-art analytical techniques including isotope ratio mass spectroscopy (IRMS), solid state 13C-NMR, and mid-infrared spectroscopy. Effects on structure and function of soil microbial communities are assessed by standard soil microbiological methods including extracellular enzyme activities and complemented by soil metaproteomics, a rapidly developing novel approach.

We hypothesize that long-term N addition will (1) foster the accumulation of soil organic matter (SOM) as well as (2) alter SOM quality and (3) its depth-distribution. Furthermore, N addition will also (4) induce changes in structure and function of microbial communities. First results on N effects on SOM quality and microbial activities in the Ah layer will be presented.