ETH zürich

Soil as a Resource
National Research Programme NRP 68

SwissSOM

WSL

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Molecular and radiocarbon sentinels of soil organic matter vulnerability: a project introduction

Claudia Zell*, Tessa van der Voort*, Xiaojuan Feng*, **, Frank Hagedorn***, Patrick Schleppi***,Timothy Eglinton*

* ETH Zurich, Geological Institute, Sonneggstrasse 5, CH-8092 Zurich, Switzerland
**Institute of Botany, Chinese Academy of Sciences, 20 Nanxincun Xiangshan, Tuzilou 218 Beijing 100093, China
***Swiss Federal Research Institute WSL, Forest soils and biogeochemistry, Zürcherstrasse 111, 8903 Birmensdorf, Switzerland

Introduction

Investigation of soil organic matter (SOM) vulnerability is important, due to its value as a resource and its role in the carbon cycle. Particular concerns exist regarding how the large pool of OM that is currently stabilized in soils will respond to the influence of climate change and increasing anthropogenic pressures. The causative factors and underlying processes that may change SOM stability are not yet well understood.

The overall goal of the project, which is part of the national research program NRP68 “Soil as a Resource”, is to provide more insights into the stability of SOM matter over different temporal and spatial scales.

Tools

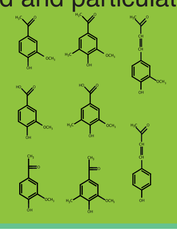
Radiocarbon of bulk soil*
Assessment of ^{14}C variations in bulk soils and soil fractions over a range of spatial scales (plot to regional scales), the goal is to create a database that will serve as a benchmark against which to gauge future change.

The comparison of contemporary and legacy (aged) samples enable insights into the changes that soils have undergone during recent years.

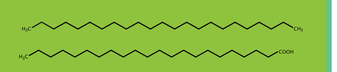
*Talk by Tessa van der Voort, Session 14, 14:45

Radiocarbon of plant biomarkes
Isotopic characterization of lignin and plant wax biomarkers to trace organic matter dynamics within different soil fractions.

Lignin
(dissolved and particulate fraction)



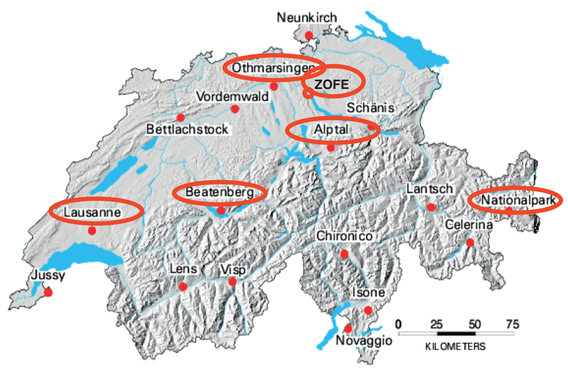
Plantwaxes
(mineral assosiated fraction)
n-alkanes and fatty acids



Study sites

Study sites represent the most common soil types in Switzerland. The forest sites are part of the Long-Term Forest Ecosystem Monitoring program (LWF) of the Swiss Federal Institute for Forest, Snow and Landscape research (WSL). The agricultural soil is from the Zurich Organic Fertilization Experiment cropland experiment (ZOFE) at the Agroscope.

Sites	Type	Soil type
Alpthal	Forest	Gleysol
Beatenberg	Forest	Podzol
Lausanne	Forrest	Cambrisol
Nationalpark	Forest	Leptosol
Othmarsingen	Forest	Luvisol
Zurich (ZOFE)	Agricultural soil	Agrosol



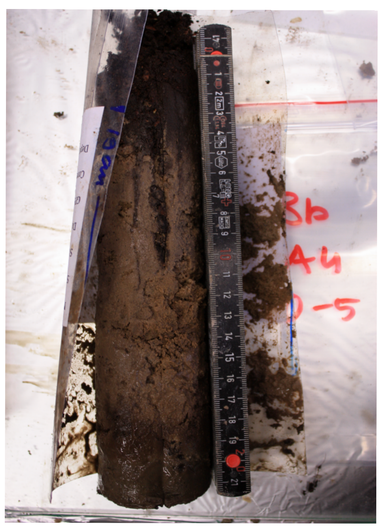
Sampling

All sites were sampled with a HUMAX soil corer. To overcome spartial variability 16 cores were taken at each site. The cores were sectioned in fractions according to soil depth.

LFH (litter, fibre, humus) layer (only Beatenberg), 0-5 cm, 5-10 cm, 10-20 cm, 20-40 cm, 40-60 cm, 60-80 cm, 80-100 cm

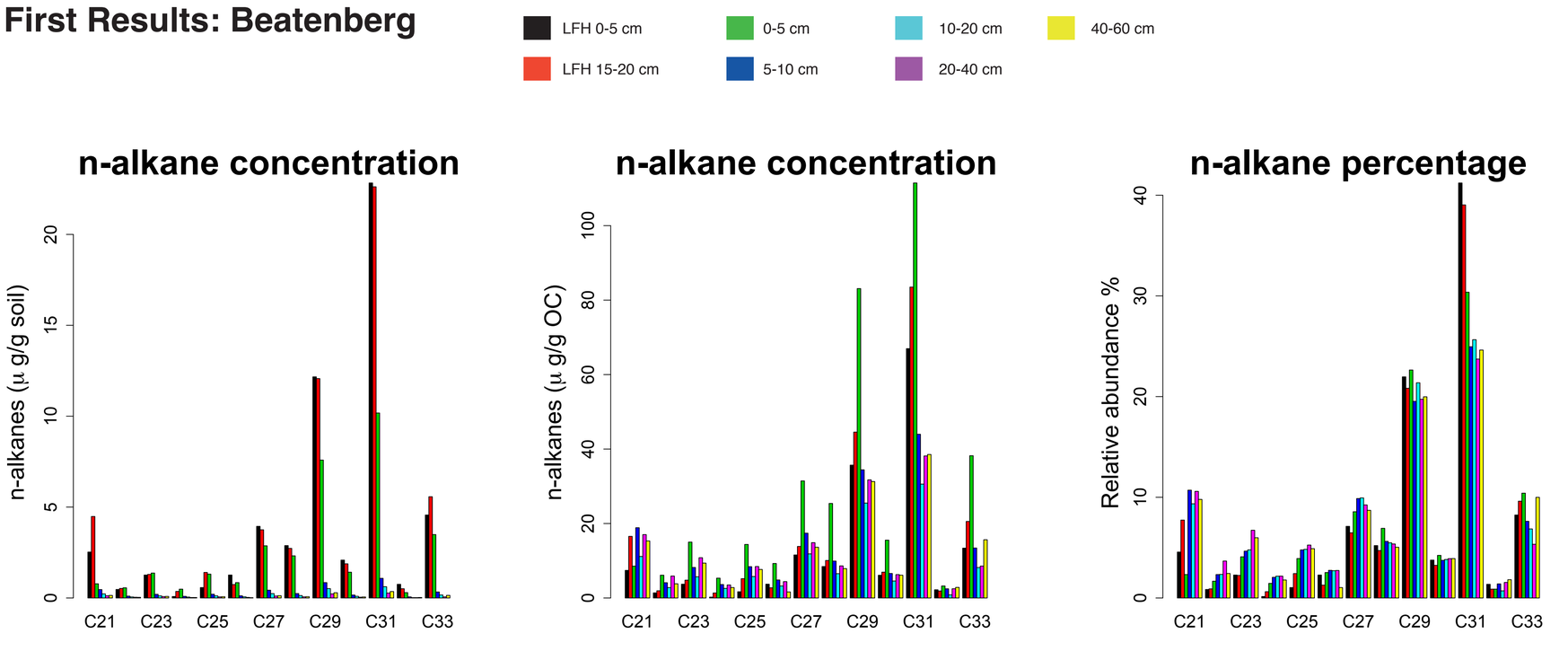
The fractions were sieved to 2 mm frozen, freeze dried and used to form composite samples.

HUMAX corer



Soil core

First Results: Beatenberg

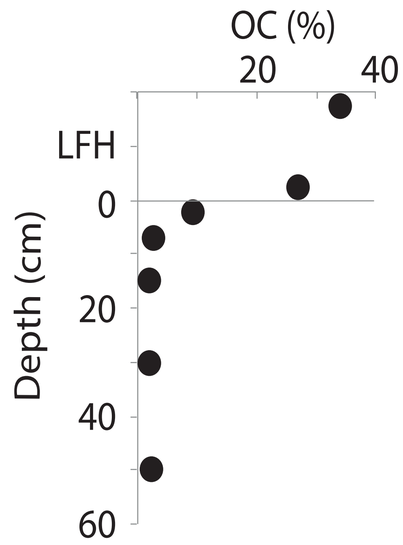


The concentration of n-alkanes and FAMEs rapidly decreases with increasing soil depth.

The concentration of n-alkanes and fatty acids normalized to organic carbon provides an insight how n-alkanes and FAMES are preserved in relation to the bulk organic matter. The highest concentrations were found in the 0-5 cm layer.

Relative abundance of high carbon number n-alkanes and FAMEs remains relativley constant over the soil depth.

Soil profile Beatenberg



Picture by Marco Walser

Next steps

Isolation of n-alkanes and fatty acids, with preparative gas chomatography for compound specific radiocarbon analysis by AMS.

Acknowledgements
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