

Natural Organic Matter Cycling on Local to Ecoregional Scales Examined through the lens of Radiocarbon

**TIMOTHY IAN EGLINTON¹, HEATHER GRAVEN²,
FRANK HAGEDORN³, SONKE SZIDAT⁴, ALEX
BRUNMAYR^{1,2}, MARGAUX MORENO DUBORGEL³,
DYLAN GEISSBUEHLER⁴, THOMAS LAEMMEL⁴, LUISA
MINICH³, BENEDICT MITTELBACH¹, TIMO RHYNER¹
AND MARGOT WHITE¹**

¹ETH Zurich

²Imperial College London

³Swiss Federal Institute for Forest, Snow and Landscape
Research WSL

⁴University of Bern

Improved constraints on carbon exchanges between atmospheric, terrestrial and aquatic systems are needed to reduce uncertainty in predictions of future carbon cycle and climate change. Natural organic matter (NOM) plays a pivotal role in the storage and exchange of carbon within and between different carbon reservoirs, yet much remains to be understood regarding factors that modulate NOM dynamics. Radiocarbon (^{14}C) is a powerful tool for examining carbon cycle processes occurring on a range of timescales, though applications of this isotope to constrain NOM turnover and transport times are typically limited in scope. As part of a collaborative initiative, the “Radiocarbon Inventories of Switzerland” (“RICH”) project has acquired a comprehensive suite of ^{14}C measurements on major carbon pools in the atmosphere, soils and the hydrosphere across the five different ecoregions of Switzerland. Central to the RICH project are ^{14}C measurements of NOM components of the dissolved and particulate phase in soils, rivers and lakes, including ^{14}C measurements on specific fractions and molecular components. These measurements are used to place constraints on specific processes involving NOM dynamics, including turnover rates of different soil carbon pools, lateral transfer times along the terrestrial and aquatic continuum and burial fluxes in lacustrine sediments. This presentation will provide illustrations of the information gleaned thus far from this collaborative undertaking. We highlight how the interplay between geomorphic properties, climate and land use influences NOM cycling within watersheds and among ecoregions. We show that carbon storage and turnover in soils plays a pivotal role in modulating terrestrial biospheric NOM composition and cycling on broader scales. In particular, we find that mineral association has a pervasive influence on NOM stability and sequestration throughout the terrestrial-aquatic continuum.