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# Char Studies Initiative Switzerland (CSI Swiss): investigating pyrogenic carbon degradation

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A critical knowledge gap in the soil organic C (SOC) cycling concerns the SOC portion known as pyrogenic C (PyC), which is a chemically heterogeneous class of highly reduced compounds produced by the incomplete combustion. Because of global changes, wildfires will be more frequent under temperate conditions, producing more fire-derived PyC. Also more N deposition might occur. This project investigates PyC degradation under varying N deposition levels.

In this long-term experiment, cylindrical mesocosms would be installed in the soil and filled with 13C/15N highly labelled substrates (pyrolyzed wood and wood), either treated with or without nitrogen. This starting project aims (1) to quantify the C and N fluxes from the soil as CO2 and dissolved organic compounds and (2) to identify underlying processes of char and wood degradation under high and low nitrogen.

We would take advantage of existing expertise, unique sample materials, and infrastructure at an already established long-term temperate forest research site (Laegern, a CarboEurope site in Zurich surroundings). We would monitor the C and N fluxes from the soil to the atmosphere and the groundwater. We would also investigate the mechanisms of decomposition and stabilisation of the PyC in the soil. This could be achieved by directly identifying micro-organisms decomposing PyC, by determining the alteration of the PyC chemical structure of the remaining char (CPMAS 13C and 15N NMR, molecular markers) in the dissolved fraction and in the bulk soil and by using the isotopes to trace the degradation products within the soil fractions and within the intact soil matrix using soil fractionation methods and NanoSIMS technology.