Influence of nitrogen deposition on carbon dynamics in peatlands

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The impact of high levels of nitrogen deposition from the atmosphere (primarily from the combustion of fossil fuels and transportation) on soil carbon fluxes and carbon sequestration pathways in peatlands are uncertain and limit our understanding of its consequence on peatlands' role as global carbon sinks. An alteration in peatlands' natural carbon accumulation process could result in the increased release of CO_2 into the atmosphere, potentially increasing the greenhouse effect and contributing to climate change.

Recent studies in forest soils have shown that high concentrations of inorganic nitrogen accelerate the activity of key soil enzymes involved in the degradation of easily decomposable litter (low lignin content) but slow down the decomposition of lignin abundant litter. Peatland soils are adapted to slow rates of nitrogen mineralization; therefore increasing the nitrogen supply in these environments may have an even deeper impact on litter quality, potential litter decomposability, and overall carbon storage capacity.

The aim of this study is to use plant wax biomarkers as proxies of vegetational change in litter profiles. An alkane and alcohol profile database of peatland vegetation is currently being characterized for comparison with samples taken from the Whim Moss experimental site (Edinburgh) where different levels of nitrogen has been added to peatland soil since 2002. A temporal study combining the MicroResp technique (community level physiological profiles) and enzyme activity assays is considered to look at the effect of litter compositional changes on soil microbial diversity and biological activity. To better understand how nitrogen deposition in peatland soil affects the mechanisms controlling carbon storage, the incorporation of stable isotope labelling (^{13}C) would allow direct determination of the fate of carbon into the different carbon pools and better pin-point the changes in litter composition.