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Carbon isotopes as indicators of peatland growth?

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As undisturbed and/or growing peatlands store considerable amounts of carbon and are unique in their biodiversity and species assemblage, the knowledge of the current status of peatlands (growing with carbon sequestration, stagnating or degrading with carbon emissions) is crucial for landscape management and nature conservation. However, monitoring of peatland status requires long term measurements and is only feasible with expert knowledge. The latter determination is increasingly impeded in a scientific world, where taxonomic expert knowledge and funding of long term monitoring is rare.

Stable carbon and nitrogen isotopes depth profiles in peatland soils have been shown to be a useful tool to monitor the degradation of peatlands due to permafrost thawing in Northern Sweden (Alewell et al., 2011; Krüger et al., 2014), drainage in Southern Finland (Krüger et al., 2016) as well as land use intensification in Northern Germany (Krüger et al., 2015). Here, we tackle the questions if we are able to differentiate between growing and degrading peats with the use of a combination of carbon stable (δ^{13}C) and radiogenic isotope data (^{14}C) with peat stratification information (degree of humification and macroscopic plant remains). Results indicate that isotope data are a useful tool to approximate peatland status, but that expert taxonomic knowledge will be needed for the final conclusion on peatland growth. Thus, isotope tools might be used for landscape screening to pin point sites for detailed taxonomic monitoring. As the method remains qualitative future research at these sites will need to integrate quantitative approaches to determine carbon loss or gain (soil C balances by ash content or C accumulation methods by radiocarbon data; Krüger et al., 2016).

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