

Research Project

Stable carbon isotopes in soils as indicators of environmental change

Third-party funded project

Project title Stable carbon isotopes in soils as indicators of environmental change

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Peatlands act as a carbon sink in pristine status by accumulation of organic material in their water saturated soils. Peatland degradation could change a peatland from a carbon (C) sink into a carbon source due to altered decomposition processes. Our hypothesis is that stable carbon isotope depth profiles indicate peatland degradation such as drainage, climate change or land use change. Aerobic decomposition leads to an enrichment of ^{13}C in aerated layers, whereas anaerobic conditions induce either a depletion of ^{13}C due to an enrichment of recalcitrant material or a uniform depth trend due to very low degradation rates (Alewell et al., 2011). We took samples from ten peatlands in a transect from northern most Europe 200 km north of the polar circle down to the Black Forest in southern Germany with different degradation causes. Stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) as well as C and N content are analysed from peat samples. Our aim in the proposed continuation is to quantify the C loss from degraded peatland by the ash method described by Leifeld et al. (2011). Selected samples will be dated with ^{14}C to know when the peat material was accumulated and to quantify the C loss by radiocarbon dates. Carbon accumulation rates will be calculated by peat ages and C stock in different depths of natural peatlands. With this and ^{14}C dated peat layers in degraded sites we can estimate the C loss from the degraded peatland. Quantification of C loss by these methods will show if land use change/intensification trigger/enhance carbon loss from peatlands. Furthermore organic matter quality of peat material will be determined by infrared spectroscopy (Leifeld et al., 2012) to deduce the sensitivity of peatland C loss to organic matter quality. A comparison of stable isotope data with ash content, organic matter quality and ^{14}C measurements will indicate if the isotope depth profiles are suitable indicators of peatland degradation.

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Alewell, C. et al. (2011) Stable carbon isotopes as indicators for environmental change in peatlands. *Biogeosciences* 8, 1769-1778.

Leifeld, J. et al. (2011) Organic matter losses from temperate ombrotrophic peatlands: an evaluation of the ash residue method. *Plant and Soil* 341, 349-361.

Leifeld, J. et al. (2012) Sensitivity of peatland carbon loss to organic matter quality. *Geophysical Research Letters* 39.

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Add publication

Published results

2005358, Krüger, Jan Paul; Gerold, Gerhard; Beckedahl, Heinz; Jungkunst, Hermann F., Effect of environmental conditions on methane and nitrous oxide fluxes of two South African wetlands, GEO-ÖKO, Publication: JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

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3289582, Krüger, Jan Paul; Alewell, Christine, Stable isotopes as indicators of environmental change, 978-87-93129-11-5, INTERACT Stories of Arctic Science, Publication: Book Item (Buchkap., Lexikonartikel, jur. Kommentierung, Beiträge in Sammelbänden etc.)

3706896, Krüger, Jan-Paul, Peatland degradation indicated by stable isotope depth profiles and soil carbon loss, Publication: Thesis (Dissertationen, Habilitationen)

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