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Autoren

L. Zeh¹, C. Schmidt-Cotta¹, L. Bragazza², J. Limpens³, K. Kalbitz¹

¹TU Dresden, Institut für Bodenkunde und Standortslehre, Tharandt; ²University of Ferrara, Department of Life Science and Biotechnologies, Ferrara, Italy; ³Wageningen University, Plant Ecology and Nature conservation group, Wageningen, Netherlands

Titel

Dissolved organic matter indicates changes in temperature and plant communities in peatlands

Abstract

Though northern peatlands cover only 3 % of the land surface they count as one of the largest terrestrial organic C pools. This huge C pool is threatened by increasing temperatures, related microbial degradation and indirect effects of climate change leading to vascular plant dominance over sphagnum mosses and a shift from graminoids to shrubs. Effects of these changes in vegetation on peat degradation are unknown. Dissolved organic matter (DOM) as an important component of the C cycle in peatlands might be used as a sensitive indicator of enhanced peat degradation. Furthermore, peatlands are the major source of DOM in many surface waters and understanding the mechanisms of peat degradation will help to elucidate the reasons for the ongoing trends of increasing concentrations of dissolved organic carbon (DOC) in surface waters. In this study we aimed to determine effects of temperature and plant functional types (PFT: graminoids, shrubs) on amounts and composition of DOM allowing conclusions about ongoing changes in peat degradation. We selected two ombrotrophic peatlands in the Italian Alps, reflecting a temperature gradient where we manipulated the vascular plant cover by selective clipping. On the established plant functional type plots we collected DOM directly after plant removal and during the following seasons over a period of one year. Besides DOC concentrations we determined DOM composition by C-13 of DOC and UV and fluorescence spectroscopy. The short term response (2-24h) of DOM to the plant clipping enabled us to estimate the C input of vascular plants via roots. The medium to long term data showed a clear relation of DOM to the temperature gradient and the PFT. All in all our results indicated a substantial contribution of the roots from vascular plants to DOM in peatlands. The release of DOM from peat clearly increased with temperature and vascular plant biomass. The difference between graminoids and shrubs seems to be marginal. We conclude that higher temperatures and greater vascular plant biomass result in increasing peat degradation as one likely reason for increasing DOC concentrations in many surface waters across Europe and North America.