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DOC export from a peat extraction site in transition to managed restoration - preliminary results of a long-term research project

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Peatlands play a major role in the global cycles of water and carbon. Budgeting carbon fluxes of temperate man-managed peatlands is limited by few available data. The main carbon compounds exported from such sites are CO_2, CH_4 and laterally exported C compounds (dissolved organic carbon (DOC) and gases). Without reliable estimates of laterally exported carbon from managed peatlands, overall carbon balances of such geoecosystems remain obscure.
The Himmelmoor peatland in Schleswig-Holstein is subject to horticultural peat extraction in transition towards managed restoration. One-third of 130 ha of peatland area are already subject to managed restoration, the remaining part is still intensively used as a peat extraction site. Surface water discharge rates are measured by a water head sensor in combination with a rectangular-shaped weir. An October-November data set (54 days period, 2012) shows a distinct base-flow and precipitation-dependent discharge peaks, which were up to five times higher than the base-flow. The observations indicate a poor water storing capacity of the intensively used areas. During this first observation period, almost 65,000 tons of peatland-DOC-bearing water have been discharged into the adjacent river system. DOC concentrations in the discharge water have been measured every 6-12 days with a Total Carbon Analyzer TOC-L (Shimadzu, Japan). Additionally, a field spectrophotometer (spectro::lyser,s-can, Austria) has been employed, for measuring quasi-continuous concentrations of DOC. During the 54 day period, approximately 1.75 g DOC m^{-2} (or about 1750 kg DOC km^{-2}) has been laterally exported from the peatland. Average DOC concentration was 35.1 ± 4 g l^{-1}. These values range in the same order of magnitude that have been published from managed UK peatlands (Armstrong et al., 2010; Wilson et al., 2011). Preliminary data evaluation of the in-situ field spectrophotometer show that DOC concentrations of discharge water varied up to 1.5 mg L^{-1} in less than six hours and up to about 3 mg L^{-1} in 36 hours.
The described recently established hydrological measurements are planned to be continued for the next ten years in combination with continuous eddy covariance measurements of land-atmosphere fluxes of Water, CO_2 and CH_4. This long-term monitoring of lateral and vertical exchange fluxes will serve as a basis for evaluating the success of the peatland restoration with respect to biogeochemical cycling and greenhouse gas budgets.

Literature

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