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The soil organic carbon content of anthropogenically altered organic soils effects the dissolved organic matter quality, but not the dissolved organic carbon concentrations

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Dissolved organic carbon (DOC) is an important link between terrestrial and aquatic ecosystems. This is especially true for peatlands which usually show high concentrations of DOC due to the high stocks of soil organic carbon (SOC). Most previous studies found that DOC concentrations in the soil solution depend on the SOC content. Thus, one would expect low DOC concentrations in peatlands which have anthropogenically been altered by mixing with sand. Here, we want to show the effect of SOC and groundwater level on the quantity and quality of the dissolved organic matter (DOM).

Three sampling sites were installed in a strongly disturbed bog. Two sites differ in SOC (Site A: 48%, Site B: 9%) but show the same mean annual groundwater level of 15 and 18 cm below ground, respectively. The SOC content of site C (11%) is similar to Site B, but the groundwater level is much lower (-31 cm) than at the other two sites. All sites have a similar depth of the organic horizon (30 cm) and the same land-use (low-intensity sheep grazing). Over two years, the soil solution was sampled bi-weekly in three depths (15, 30 and 60 cm) and three replicates. All samples were analyzed for DOC and selected samples for dissolved organic nitrogen (DON) and delta-13C and delta-15N.

Despite differences in SOC and groundwater level, DOC concentrations did not differ significantly (A: 192 $\pm$ 62 mg/L, B: 163 $\pm$ 55 mg/L and C: 191 $\pm$ 97 mg/L). At all sites, DOC concentrations exceed typical values for peatlands by far and emphasize the relevance even of strongly disturbed organic soils for DOC losses. Individual DOC concentrations were controlled by the temperature and the groundwater level over the preceding weeks. Differences in DOM quality were clearer. At site B with a low SOC content, the DOC:DON ratio of the soil solution equals the soil's C:N ratio, but the DOC:DON ratio is much higher than the C:N ratio at site A. In all cases, the DOC:DON ratio strongly correlates with delta-13C. There is no isotope data for site C. Delta-15N is more enriched at site B than at site A, indicating differences in C and N cycling and potential influence of the dominant vegetation (grasses vs. Sphagnum mosses).