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Titel
Plant functional type affects composition and degradation of peat along a temperature gradient

Abstract
Peatlands, storing significant amounts of carbon (C), are extremely vulnerable to climate change. Indirect effects of climate change are projected to lead to a growing dominance of vascular plants in moss dominated peatlands with unknown effects on peat decomposition. In this study we investigated the influence of different plant functional types (moss, graminoid, shrub) on peat composition and decomposition. Peat cores (20 cm depth) and plant material (Sphagnum sp., Calluna vulgaris, Eriophorum vaginatum) of two ombrotrophic moss dominated peatlands on a temperature gradient in the Italian Alps were analyzed. Peat cores were taken under shrub and graminoid coverage at the low temperature site (Low-T-Site) and the high temperature site (High-T-Site). We used carbon to nitrogen ratios, C-13 and N-15 and pyrolysis gas chromatography/mass spectrometry (py-GC/MS) to assess the influence of vascular plants on peat composition and degradation. In these moss dominated peatlands, methoxyphenols from lignin indicated highest contribution of vascular plant material at 2-5 cm under shrub coverage and 5-12 cm depth under graminoid coverage. Increasing C-13 ratios with depth could be related to increasing peat decomposition. This increase was higher for peat cores under graminoid coverage than under shrub coverage. Furthermore, the enrichment in C-13 with depth was higher at the High-T-Site than at the Low-T-Site. More detailed effects of plant functional type on peat degradation were established using species specific pyrolysis products as e.g. methoxyphenols from lignin (marker compounds for vascular plants) and 4-isopropenylphenol reflecting degradation of the sphagnum peat matrix. Comparing depth records of these molecular parameters indicated higher peat degradation in the presence of graminoids compared to shrubs and at the High-T-Site compared to the Low-T-Site confirming conclusions from C-13 data. Consequently, plant functional types are very likely to influence peat composition and degradation especially at elevated temperatures, while the projected vegetation shifts from graminoids to shrubs should counteract increasing peat degradation with increasing temperature. Therefore, vegetation shifts in response to climate change may play a crucial role in determining peat composition and degradation.