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Organic matter loss from temperate ombrotrophic peatlands: An evaluation of the ash residue method

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Acting as “carbon sinks” that store more carbon per unit area than any other ecosystem, peatlands play a major role in regulating global climate. This is slowly but increasingly recognized, hence there is an urgent need to estimate the carbon budgets of peatlands more precisely. Due to increased aeration and successive oxidation, pristine peatlands usually release much carbon upon drainage. However, there is a lack of both data and appropriate methods for a generalized large-scale prediction of these emissions. Intact ombrothrophic peatlands are characterized by low ash contents. But there is a significant increase of the ash content after water level drawdown following drainage accelerating the decomposition of organic matter. To infer carbon losses from drainage we compared ash contents of deeper catotelm peat layers and near-surface peat layers and we relied on the results of soil carbon inventories as well. Four sites each of different drainage status and land use history in Central Europe have been selected for analysis. The method proved to yield reasonable results, at least for two drained sites where the mean loss rates varied between 0.14 and 0.49 kg C m-2 a-1. However, also a pristine bog showed relative ash accumulation. Therefore ash accumulation seems not exclusively being confined to drained sites. Previous land management seems to play a quite important role, too. Rehabilitation of a previously impaired site dissipated the original ash peak profile. In conclusion, the method is suitable to predict carbon losses from ombrothrophic bogs, at least in some cases. However, in countries with a long lasting tradition of anthropogenic interference, like in Europe, it is difficult to attribute drainage as the only factor of ash accumulation in ombrotrophic peatlands.