



Greenhouse gas budgets for grasslands on peatlands and other organic soils

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Drained peatlands are hotspots of greenhouse gas (GHG) emissions. Grassland is the major land use type for peatlands in Germany and other European countries, but strongly varies in its intensity regarding the groundwater level and the agricultural management. These parameters are known to influence the GHG emissions. Furthermore, little is known about the emissions from grasslands on soils which are rich in organic matter, but cannot be classified as peatlands (e.g. Histic Gleysols).

We synthesized 116 annual GHG budgets for 46 different sites in 11 German peatlands. Carbon dioxide (net ecosystem exchange and ecosystem respiration), nitrous oxide and methane fluxes were measured with transparent and opaque manual chambers. Land management ranged from very intensive use with up to five cuts per year to re-wetted grasslands with only one cut late in the year. Besides the GHG fluxes, biomass yield, fertilisation, groundwater level, climatic data, vegetation composition and soil properties were measured.

Overall, we found a large variability of the total GHG budget ranging from small uptakes (- 6 t CO₂-equivalents/(ha yr)) to very high losses (74 t CO₂-equivalents/(ha yr)). At all sites, the GHG budget was dominated by carbon dioxide, generally followed by biomass export. Surprisingly, there was no difference between the average GHG budget of the peatlands and of the other organic soils. Thus, the GHG budget did not depend on soil organic carbon concentration or stock. Generally, the groundwater table depth was the best predictor for GHG emissions at each individual peatland, but a poor overall predictor. For all sites, the GHG budget was explained best by the average nitrogen stock above the mean groundwater level.