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Tracking changes in land-use and drainage status of organic soils using heterogeneous spatial datasets

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Tracking land-use since 1990 is one of the major challenges in greenhouse gas (GHG) reporting under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, as the data availability, especially for the base year 1990, is often poor. Even if data is available, spatial and thematic resolution will often change over time or differ even within one country. Such inconsistencies will cause a strong overestimation of land use change (LUC) if not adequately accounted for.
Using different spatial datasets, we present a method that allows tracking changes in land-use and drainage status of organic soils. The drainage status is relevant for the Kyoto activities grazing land management (GM) and wetland drainage and rewetting (WDR) as the GHG emissions of organic soils strongly depend on the groundwater level. We used datasets that are already used for the German national inventory report (Digital Landscape Model of official cadastre data) and high resolution spatial datasets (CIR aerial photography) derived for biodiversity monitoring of six federal states in North and East Germany. This data is combined with the legal protection status such as nature conservation areas. To create a consistent time series, we developed a translation key which allows quantifying gross and net LUC in a spatially explicit manner.
The developed method fills the lack of data for 1990 and allows GHG accounting on higher Tier levels as soon as detailed emission factors are ready to be implemented. LUC can be stratified by the protection status. Areas without a protection status show a trend towards both intensification of land-use and drier conditions. Highly protected areas show an opposite trend while a moderate protection level (e.g. by nature parks) did only have very weak effects. Furthermore, there are major differences between federal states. In Schleswig-Holstein, known as a federal state of high agricultural production, organic soils tend to become drier and even highly protected areas only show a slight decrease of land-use intensity. Organic soils in Mecklenburg-Western Pomerania, on the other hand, tend to become wetter and less intensively used even in not protected areas. This can be interpreted as a result of an extensive peatland protection programme.
Thus, our method does not only allow tracking drainage status and land-use in a suitable way for higher Tier levels in GHG-inventories and for Kyoto-accounting, but offers additional information on the success of large scale rewetting practises.