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Modeling water table dynamics in managed and restored peatlands

Fabio Cresto Aleina (1), Livia Rasche (2), Renée Hermans (3), Jens-Arne Subke (3), Uwe Schneider (2), and Victor Brovkin (1)

(1) Max Planck Institute for Meteorology, Germany , (2) University of Hamburg, Center for Earth System Research and Sustainabilit, (3) University of Stirling

European peatlands have been extensively managed over past centuries. Typical management activities consisted of drainage and afforestation, which lead to considerable damage to the peat and potentially significant carbon loss. Recent efforts to restore previously managed peatlands have been carried out throughout Europe. These restoration efforts have direct implications for water table depth and greenhouse gas emissions, thus impacting on the ecosystem services provided by peatland areas. In order to quantify the impact of peatland restoration on water table depth and greenhouse gas budget, We coupled the Environmental Policy Integrated Climate (EPIC) model to a process-based model for methane emissions (Walter and Heimann, 2000). The new model (EPIC-M) can potentially be applied at the European and even at the global scale, but it is yet to be tested and evaluated. We present results of this new tool from different peatlands in the Flow Country, Scotland. Large parts of the peatlands of the region have been drained and afforested during the 1980s, but since the late 1990s, programs to restore peatlands in the Flow Country have been enforced. This region offers therefore a range of peatlands, from near pristine, to afforested and drained, with different resoration ages in between, where we can apply the EPIC-M model and validate it against experimental data from all land stages of restoration

Goals of this study are to evaluate the EPIC-M model and its performances against in situ measurements of methane emissions and water table changes in drained peatlands and in restored ones. Secondly, our purpose is to study the environmental impact of peatland restoration, including methane emissions, due to the rewetting of drained surfaces. To do so, we forced the EPIC-M model with local meteorological and soil data, and simulated soil temperatures, water table dynamics, and greenhouse gas emissions. This is the first step towards a European-wide application of the EPIC-M model for the assessment of the environmental impact of peatland restoration.