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Global peatlands and the carbon cycle during the last millennium

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Coupled climate carbon cycle models point to a positive climate-carbon feedback, whereby climate change results in a larger fraction of anthropogenic CO_2 emissions remaining in the atmosphere, further warming the climate. However, the strength of this feedback is highly uncertain and the terrestrial carbon cycle feedback is the least well quantified. Furthermore, models have completely ignored the potential contribution of peatlands, even though they contain 530-694 GtC, i.e. almost as much as the total amount of carbon in the atmosphere. Even the sign of the contribution of peatlands to the global carbon cycle feedback is poorly known. The assessment of this feedback is limited by the available the spatial coverage of carbon accumulation data from peatlands, especially away from northern latitudes.

Efforts have been made to widen our understanding of the potential of different peatlands to accumulate carbon. This synthesis effort has led to a compilation of a dataset of carbon accumulation rates for most latitudes and regions during the last millennium (850-1850 AD).

Benefiting from this data, this study takes into account a range of peatland types and novel regions (tropics, China, etc), where carbon accumulation can be very high. The aim of this study is to assess the contribution of peatlands to the global carbon cycle over the last millennium, in order to provide a basis for projections of future peatland-climate feedbacks and to enable inclusion of these effects in climate models. First, the spatial extent and the carbon fluxes of peatlands simulated with the LPX model are evaluated against the newly available dataset. Second, the simulated carbon fluxes are used to assess the sign and magnitude of the feedback of peatlands on climate.

It is expected that the feedback effects included in LPX, e.g. between peatlands and hydrology or nitrogen availability, play an important role in the response of the model to changes in climate.