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Modelling sub-grid peatland vegetation dynamics in the ORCHIDEE-PEAT land surface model

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Peatlands store about one-third of global soil organic carbon. The carbon dynamics and storage of peatlands depend on the balance between plants' carbon uptake and microbial carbon decomposition. As a result of global warming and climate-driven ecohydrological changes, the plant community composition of peatlands is projected to change, affecting the carbon sequestration and storage capacity of these ecosystems both directly and indirectly by modulating water flows. However, while there has been a notable focus on studying the variation in the water table position of peatlands and its consequential influence on the dynamics of peatland soil carbon, the impacts of peatland plant community composition have been largely overlooked. To accurately predict peatland carbon dynamics, land surface models need to account for the diversity of peatlands plant types and the competitive interactions among them. We incorporated six plant functional types (PFT) into the ORCHIDEE-PEAT model to represent mosses, grasses, shrubs, and trees growing in peatlands. Areas covered by each PFT are functions of the bioclimatic limitations, mortality, and establishment of each PFT, as well as competitions among PFTs. The model will be employed to assess the effect of climate change on peatland vegetation dynamics and carbon fluxes.