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Late Holocene peatland carbon dynamics inferred from Teringi Bog in southern Estonia

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Radiocarbon dated peat cores collected along a transect from Teringi Bog, an ombotrophic peatland, record changes in carbon accumulation rates during the late Holocene in response to shifting climatic conditions. Stable oxygen isotope records from nearby lakes indicate that periods of wetter conditions during the Holocene occurred at times when carbon accumulation rates were higher at Teringi. This suggests that shifting water table conditions drove much of the observed changes in carbon dynamics. Modern surface process observations indicate that carbon accumulation rates are indeed more variable at locations where the height of the water table is highly sensitive to rainfall amounts. In addition, carbon isotopes measured on water samples indicate that there is a close relationship between δ13C values and methane concentrations, suggesting that methanogenesis is strongly biomediated, and likewise varies as a function of the regional hydrology. Regardless, all of the cores collected indicate that there was a trend toward higher carbon accumulation rates from $\sim$4.2 to 3.5 ka when precipitation amounts were higher, followed by lower values under drier conditions until $\sim$2.8 ka. There was then a trend toward higher carbon accumulation rates through the remaining late Holocene. These observations further highlight the importance of high latitude peatland in global carbon dynamics as both a potential sink and source of CO_2 and CH4.