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## Impact of climate extremes on peatland carbon dynamics across Northern Europe

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Climate change and concurrent climate extremes lead to rapid changes in environmental conditions globally. These changes impact the role of terrestrial ecosystems in the global carbon (C) cycle, thus creating a feedback mechanism to climate. Peatlands, specifically, play a critical role in the terrestrial C cycle due to their high-density organic C stocks, thus, slight changes in the environmental drivers can trigger strong responses in their C dynamics. Here, we investigate the impact of climate extremes, such as hydrological and temperature anomalies on the C emission dynamics of a series of peatlands across Northern Europe. We use long-term datasets of high-resolution carbon exchange measurements and environmental variables of peatlands to systematically identify extreme events in the carbon fluxes as well as in their environmental drivers and how they connect. We subsequently quantify the impact of drivers' anomalies on CO<sub>2</sub> and CH<sub>4</sub> exchange of peatland ecosystems. We specifically focus on the response of C-emissions to changes in water level, temperature and vegetation development before, during, and after the 2018 European summer drought to show the combined effect on the annual CO<sub>2</sub> and CH<sub>4</sub> balances in rewetted and pristine peatlands. Categorizing these impacts according to the environmental conditions and/or their changes, duration, frequency and severity of anomalies and peatland type will help to refine common peatland emission factors used to estimate C dynamics for national and international greenhouse gas emission inventories.