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Modelling response of European-scale carbon fluxes to extreme events

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Terrestrial ecosystems are currently acting as a sink for carbon dioxide. However, large uncertainties exist regarding the carbon cycle response to increasing greenhouse gases and temperature. Especially the influence of climate variability and weather extremes on ecosystems and the associated carbon fluxes is still poorly known. It is crucial to understand the impact of extreme events such as droughts, heat waves and heavy precipitation on the terrestrial biosphere and its capacity to continue acting as a carbon sink, especially in view of the likely increase in frequency and severity of such events in the future.

The EU FP7 CARBO-Extreme project analyzes the terrestrial carbon cycle in Europe under the influence of climate variability and extremes and aims to improve the understanding of these processes.
As part of this project we conduct experiments with the Community Land Model (CLM4.0), a state of the art land surface model that includes both carbon and nitrogen cycle processes, thus allowing the investigation of the role of nitrogen limitation on the inferred carbon cycle response. Experiments for the period 1900-2100 are analyzed as well as artificial scenarios in which the frequency of extreme events is modified. This allows to determine the impact of these extreme events and the role of the various climate drivers on the simulated carbon cycle in different ecosystems.