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# A new concept to study the effect of climate change on different flood types

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Flooding is triggered by the interaction of various processes. Especially important are the hydrological conditions prior to the event (e.g. soil saturation, snow cover) and the meteorological conditions during flood development (e.g. rainfall, temperature). Depending on these (pre-) conditions different flood types may develop such as long-rain floods, short-rain floods, flash floods, snowmelt floods and rain-on-snow floods.

A new concept taking these factors into account is introduced and applied to flooding in the Elbe River basin. During the period September 1957 to August 2002, 82 flood events are identified and classified according to their flood type. The hydrological and meteorological conditions at each day during the analysis period are detemined. In case of the hydrological conditions, a soil moisture pattern classification is carried out. Soil moisture is simulated with a rainfall-runoff model driven by atmospheric observations. Days of similar soil moisture patterns are identified by a principle component analysis and a subsequent cluster analysis on the leading principal components. The meteorological conditions are identified by applying a cluster analysis to the geopotential height, temperature and humidity fields of the ERA40 reanalysis data set using the SANDRA cluster algorithm. We are able to identify specific pattern combinations of hydrological pre-conditions and meteorological conditions which favour different flood types.

Based on these results it is possible to analyse the effect of climate change on different flood types. As an example we show first results obtained using an ensemble of climate scenario simulations of ECHAM5 MPIOM model, taking only the changes in the meteorological conditions into account. According to the simulations, the frequency of the meteorological patterns favouring long-rain, short-rain and flash floods will not change significantly under future climate conditions. A significant increase is, however, predicted for the amount of precipitation associated with many of the relevant meteorological patterns. The increase varies between 12 and 67% depending on the weather pattern.