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Analysis of weather patterns for attribution of changes in floods to anthropogenic climate change

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Detection of changes in the frequency and/or magnitude of floods has been extensively carried out for many river basins worldwide. However, little effort has been made so far to attribute these changes to certain drivers such as climate change, changes in land use, catchment properties, or river training. The knowledge of reasons behind observed changes is essential in order to better quantify related risks and to be able to adapt to changing flood risks or to take action to reduce them. As climate change is assumed to be a significant driver of changes in the past decades and near future, the contribution of climate change to changes in floods is of great interest. To quantify the flood risk attributable to climate change, a hydrological model can be run with different climate input – weather time series representing the observed climate or a climate without the influence of anthropogenic greenhouse gas emissions (non-GHG). These two different states of the climate system are assumed to be represented in the occurrence of weather patterns. Each weather pattern can be linked to an individual distribution of values of weather variables (e.g. precipitation, temperature, etc.). This link can be established by first applying a weather pattern classification scheme to large-scale gridded observations, and secondly deriving the distribution of values of weather variables that were observed locally during the same weather pattern occurrence. After applying the weather pattern classification scheme to the GCM output as well, values for weather variables can be drawn from the derived distributions, resulting in new weather time series for local stations. The derivation of weather patterns and establishment of a link to local weather variables is presented in this contribution.