



Analyzing long-term trends and variability of extreme precipitation across Europe using a quasi-stochastic data set of regional climate simulations

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One of the most frequent and destructive natural hazards in Central Europe are pluvial flood events associated with widespread heavy precipitation. In a current project, Karlsruhe Institute of Technology (KIT) in cooperation with Aon Benfield is developing a stochastic meteorological data set, that serves as input to a rainfall-runoff model in order to obtain discharge estimates and a detailed loss evaluation.

Since time series of precipitation show a high temporal variability, it is expedient to use long-term data sets to investigate the frequency and intensity of extreme precipitation events. Unfortunately, the quality and availability of the meteorological observations across Europe are quite heterogeneous and only available for a limited time period. A possible way to obtain a consistent data set is to consider long-term reanalysis data. Given that the common resolution of such reanalysis is too low to run hydrological models, the reanalysis are first dynamically downscaled with the regional climate model COSMO-CLM (CCLM) to 25 km resolution.

We validated the reliability of the obtained data set by comparing it to the gridded observational data set E-OBS. The focus hereby lies on the Rhine, Danube, Elbe, Oder and Vistula catchments as well as the Prudence Regions 4 and 6. We also use E-OBS to reduce well known model artifacts, such as drizzle-effect and biases.

The benefits of having such a stochastic data set are various: on a scientific purpose, analysis of long-term trends and the (multi-) decadal variability can be done in respect of the given uncertainty of the observations especially in the early 20th century. Furthermore, possible correlations of the temporal evolution to teleconnections such as AMO or NAO can be investigated. On the other hand, the probability of extremes and related hazards and risks can be estimated which is of importance, for example, for the insurance industry, flood protection systems or policy makers.