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Characterization of flood and precipitation events in Southwestern Germany and stochastic simulation of extreme precipitation (Project FLORIS-SV)

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Several major flood events occurred in Germany in the past 15-20 years especially in the eastern parts along the rivers Elbe and Danube. Examples include the major floods of 2002 and 2013 with an estimated loss of about 2 billion Euros each. The last major flood events in the State of Baden-Württemberg in southwest Germany occurred in the years 1978 and 1993/1994 along the rivers Rhine and Neckar with an estimated total loss of about 150 million Euros (converted) each.

Flood hazard originates from a combination of different meteorological, hydrological and hydraulic processes. Currently there is no defined methodology available for evaluating and quantifying the flood hazard and related risk for larger areas or whole river catchments instead of single gauges. In order to estimate the probable maximum loss for higher return periods (e.g. 200 years, PML200), a stochastic model approach is designed since observational data are limited in time and space.

In our approach, precipitation is linearly composed of three elements: background precipitation, orographically-induces precipitation, and a convectively-driven part. We use linear theory of orographic precipitation formation for the stochastic precipitation model (SPM), which is based on fundamental statistics of relevant atmospheric variables. For an adequate number of historic flood events, the corresponding atmospheric conditions and parameters are determined in order to calculate a probability density function (pdf) for each variable. This method involves all theoretically possible scenarios which may not have happened, yet.

This work is part of the FLORIS-SV (**FLO**od **RIS**k **S**parkassen **V**ersicherung) project and establishes the first step of a complete modelling chain of the flood risk. On the basis of the generated stochastic precipitation event set, hydrological and hydraulic simulations will be performed to estimate discharge and water level. The resulting stochastic flood event set will be used to quantify the flood risk and to estimate probable maximum loss (e.g. PML200) for a given property (buildings, industry) portfolio.