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Assessment of large-scale flood events by different indicators

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An analysis of real large-scale flood events reveals that there is considerable variation in the return periods of the discharges within a river basin. The assessment of the return period of the whole event has thus to be evaluated on the basis of the overall impact of the event. For example, a frequency analysis of a series of annual flood damages (loss accumulation) would enable us to assign an exceedance probability to each event. However, in practise, time series of losses or other impact variables are hardly available or their usage is limited due to changes in time of the land use of the areas prone to inundation and their assets (building values, assets of companies and infrastructure).

Using a reach at the River Rhine between the gauges Maxau and Rees as an example, a probabilistic model for the calculation of flood risks has been set up. The model is based on a flood classification at the river Rhine, which is then combined with flood frequency, correlation and regression analyses. Inundation areas are calculated by means of a hydraulic transformation. In the framework of a Monte-Carlo-Simulation 100 flood scenarios were derived and different impact parameters were determined, i.e. the total inundated area, the inundated settlement and industrial area, the exposed population as well as the potential damage to residential buildings as estimated by the loss model FLEMOps.

The impact analyses were further used to construct a frequency distribution of each impact variable. By these the return periods of a number of historical flood events and a few static flood scenarios that were used for hazard mapping were estimated. The results will be discussed in the context of risk transfer systems and risk communication issues.