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# MUNSTAR - Methodical investigation concerning the revision of heavy rainfall statistics for Germany

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Due to global climate change an increase in mean air temperature and, therefore, an increase in the absorption of water vapor in the atmosphere is expected in the future. The intensification of extreme precipitation and subsequent severe flooding is presumed as one likely consequence of global climate change for the region of central Europe and Germany. Determination of decisive design precipitation rates (Intensity Duration Frequency (IDF) or Depth Duration Frequency (DDF) curves) can serve as essential data base for precise sizing of water management structures for protection against flooding in heavily populated areas. Based on precipitation data obtained from the German Weather Service (DWD) the calculation of design precipitation rates in form of coordinated heavy rain regionalization and evaluation (KOSTRA-DWD) is available since the early 1980s in order to analyze the occurrence probabilities of heavy precipitation. Within this study we aim to update and supplement the existing data base and thoroughly revise the statistical methodology.

Extreme value statistics is a widely accepted tool to describe the magnitude and the probability of occurrence. Homogeneous long-term time series of precipitation are one basic requirement for the application of extreme value statistics. Since the monitoring network of precipitation is under constant change, it is necessary to acquire long-term and spatio-temporal high-resolution time series based on all available precipitation data in Germany. Based on this extensive station network, a thoroughly quality-controlled data set is provided, which is further checked for stationarity and homogeneity. In addition to these long-term in-situ precipitation time series, active remote sensing techniques – i.e. weather radar data - has offered the possibility of extensive precipitation detection over the past decades.

Due to the high temporal and spatial variability of heavy precipitation events, it is necessary to carry out both, local extreme value statistics as well as spatial regionalization of heavy precipitation rates to provide reliable values of the design precipitation for unobserved locations. In addition, the regionalization process will produce a more robust estimate of values through an enlarged sample. Based on the thoroughly quality-controlled time series, extreme value series (block maxima, peak-over-threshold, and multiple block maxima) are derived for different duration levels (5 min to 72 h). Subsequently, these extensive homogeneity tests are subjected to and evaluated by adapting different multi-parametric distribution functions (for example GEV or GPD) for the determination of the design precipitation for different duration stages.

The regionalization will be based on the selection of different duration levels, as well as on multiple regression geo-statistic interpolation. The quality of the various methods will then be further determined by means of cross-validation. In this contribution we present the project MUNSTAR and its first results.