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The end of trend-estimation for extreme floods under climate change?

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An increased risk of flood events is one of the major threats under future climate change conditions. Therefore, many recent studies have investigated trends in flood extreme occurences using historic long-term river discharge data as well as simulations from combined global/regional climate and hydrological models.
Severe floods are relatively rare events and the robust estimation of their probability of occurrence requires long time series of data (6). Following a method outlined by the IPCC research community, trends in extreme floods are calculated based on the difference of discharge values exceeding e.g. a 100-year level (Q100) between two 30-year windows, which represents prevailing conditions in a reference and a future time period, respectively.
Following this approach, we analysed multiple, synthetically derived 2,000-year trend-free, yearly maximum runoff data generated using three different extreme value distributions (EDV). The parameters were estimated from long term runoff data of four large European watersheds (Danube, Elbe, Rhine, Thames). Both, Q100-values estimated from 30-year moving windows, as well as the subsequently derived trends showed enormous variations with time: for example, estimating the Extreme Value (Gumbel) - distribution for the Danube data, trends of Q100 in the synthetic time-series range from -4,480 to 4,028 m^3/s per 100 years (Q100 =10,071m^3/s, for reference). Similar results were found when applying other extreme value distributions (Weibull, and log-Normal) to all of the watersheds considered.
This variability or "background noise" of estimating trends in flood extremes makes it almost impossible to significantly distinguish any real trend in observed as well as modelled data when such an approach is applied. These uncertainties, even though known in principle are hardly addressed and discussed by the climate change impact community. Any decision making and flood risk management, including the dimensioning of flood protection measures, that is based on such studies might therefore be fundamentally flawed.