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Temporal development of extreme precipitation in Germany projected by EURO-CORDEX simulations

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A sustainable operation of transport infrastructure requires an enhanced resilience to the increasing impacts of climate change and related extreme meteorological events. To meet this challenge, the German Federal Ministry of Transport and Digital Infrastructure (BMVI) commenced a comprehensive national research program on safe and sustainable transport in Germany. A network of departmental research institutes addresses the “Adaptation of the German transport infrastructure towards climate change and extreme events”.

Various studies already have identified an increase in the average global precipitation for the 20th century. There is some indication that these increases are most visible in a rising frequency of precipitation extremes. However, the changes are highly variable between regions and seasons. With a further increase of atmospheric greenhouse gas concentrations in the 21st century, the likelihood of occurrence of such extreme events will continue to rise.

A kernel estimator has been used in order to obtain a robust estimate of the temporal development of extreme precipitation events projected by an ensemble of EURO-CORDEX simulations. The kernel estimator measures the intensity of the poisson point process indicating temporal changes in the frequency of extreme events. Extreme precipitation events were selected using the peaks over threshold (POT) method with the 90th, 95th and 99th quantile of daily precipitation sums as thresholds. Application of this non-parametric approach with relative thresholds renders the use of a bias correction non-mandatory. In addition, in comparison to fitting an extreme value theory (EVT) distribution, the method is completely unsusceptible to outliers.

First results show an overall increase of extreme precipitation events for Germany until the end of the 21st century. However, major differences between seasons, quantiles and the three different Representative Concentration Pathways (RCP 2.6, 4.5, and 8.5) have been identified. For instance, the frequency of extreme precipitation events more than triples in the most extreme scenario. Regional differences are rather small with the largest increase in northern Germany, particularly in coastal regions and the weakest increase in the most southern parts of Germany.