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Future European changes of extreme precipitation : What can we learn from inter-model cross-validation?

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Severe precipitation events occur rarely and are often localized in space and of short duration, but are important for societal managing of infrastructure such as sewage systems, metros etc. Therefore, there is a demand for estimating expected future changes in the statistics of these rare events. These are usually projected using RCM scenario runs combined with extreme value analysis to obtain selected return levels of precipitation intensity. However, due to RCM imperfections, the modelled climate for the present-day usually has errors relative to observations. Therefore, the RCM results are 'error corrected' to match observations more closely in order to increase reliability of results.

In the present work we evaluate different error correction techniques and compare with non-corrected projections. This is done in an inter-model cross-validation setup, in which each model in turn plays the role of observations, against which the remaining error-corrected models are validated. The study uses hourly data (historical & RCP8.5 late 21st century) from 13 models covering the EURO-CORDEX ensemble at 0.11 degree resolution (about 12.5 km), from which fields of selected return levels are extracted for 1 h and 24 h duration. The error correction techniques applied to the return levels are based on extreme value analysis and include analytical quantile-quantile matching together with a simpler climate factor approach.

The study identifies regions where the error correction techniques perform differently, and therefore contributes to guidelines on how and where to apply calibration techniques when projecting extreme return levels.