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Projections of future precipitation extremes over Europe: a multi-model assessment of climate simulations

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We here present a systematic analysis of all available 12 and 50 km resolution EURO-CORDEX simulations forced by RCP2.6, RCP4.5 and RCP8.5 emission scenarios in terms of daily precipitation over the entire European continent. The study also provides an intercomparison against the previous generation of simulations from the ENSEMBLES project, such that in total 100 RCM simulations are analysed. Consideration is given to basic climatological, heavy and extreme precipitation indices, including the application of Generalized Extreme Value analysis for the assessment of rare events.

An evaluation finds very reasonable skill for the EURO-CORDEX models in simulating temporal and geographical variations of (mean and heavy) precipitation at both horizontal resolutions.

Projections show that heavy and extreme precipitation events intensify across most of Europe throughout the whole year. All considered models agree on a distinct intensification of extremes by often more than +20% in winter and fall and over Central and Northern Europe. A reduction of rainy days and mean precipitation in summer is simulated by a large majority of models in the Mediterranean area, but inter-model spread between the simulations is large. In Central Europe and France during summer, models project decreases in precipitation but more intense heavy and extreme rainfalls.

The results additionally include an analysis of projected change at an equal global warming level of 2° and thus facilitate a systematic comparison between different emission scenarios and previous model generations.
Comparison to previous RCM projections from ENSEMBLES reveals consistency but slight differences in summer, where reductions in Southern European precipitation are not as pronounced as previously projected.

The projected changes of the European hydrological cycle may have substantial impact on environmental and anthropogenic systems. In particular, the simulations indicate a rising probability of summer-time drought in southern Europe and more frequent and intense heavy rainfall across all of Europe.

The results presented here have recently been published in the peer-reviewed literature.

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