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An ensemble climate projection of extreme precipitation by the end of the 21st century using four convection-permitting climate models for Belgium

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Nowadays, more and more climate studies are performed at high resolution using regional climate models. Advancements in computing power have given the possibility to even refine the resolutions of those models towards the kilometre scale. These so called convective-permitting models (CPMs) are frequently used in climate studies investigating extreme precipitation events, since they are able to explicitly resolve deep convection. Numerous studies have proven that CPMs better reproduce extreme precipitation statistics than coarser-resolution climate models especially at the sub-daily intervals. As such, they have already been used to perform climate projections in different regions of the world. However, climate models differ in terms of model physics, numerics and input parameters yielding different climate-change statistics. At the same time, existing studies base their analyses only on one single CPM. In order to provide robust climate-change information accounting for the model uncertainty, an ensemble is required that combines output of different models. Up to now, an ensemble of CPMs has not been constructed. Recently, as part of the CORDEX.be project (http://www.euro-cordex.be/), a range of climate simulations with four different convective-permitting climate models have become available for Belgium, including MAR, ALARO-0, COSMO-CLM featuring an urban parametrization, and COSMO-CLM featuring a hail parametrization. This work will contribute to this framework by providing a first multi-model climate projection of extreme precipitation for Belgium under the RCP8.5 scenario using simulation sets (2071-2100 versus 1976-2005) of the different CPMs, each employing boundary conditions from a different general circulation model. In order to do so, the (sub)daily extreme precipitation statistics for the different CPMs will bee examined with the percentile-threshold methodology of Vanden Broucke et al. (2017). Finally, the differences between the CPM outputs will be analysed for providing information about the uncertainties in the ensemble projection of extreme precipitation.

References:

Vanden Broucke, S., Wouters, H., Demuzere, M., van Lipzig., N.P.M. (2017). Added value of convection-permitting scale in simulating future change in extreme precipitation depends on topography and timescale (under review).