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Downscaling precipitation at convection resolving scale using COSMO-CLM.

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Coupled atmosphere-ocean general circulation models (AOGCMs) are used to make climate projections for the next centuries. In these models, large scale atmospheric circulation is resolved by the model grid. However, the resolution remains too coarse and does not provide enough accuracy to represent processes occurring on a smaller scale. Unfortunately, those processes are often most relevant in order to assess the local impact of a future climatic change. The use of regional climate modelling at convection resolving scale is one of the most desirable techniques to downscale AOGCM output and to physically represent these small scales processes. As this field is still under development, performing reliable climate simulations at such resolution requires a new model setup.
In this study, four experiments have been performed in order to investigate the most appropriate configuration for simulating precipitation over Belgium. These experiments focus particularly on the spatial requirement of the model, viz. the domain size and the vertical resolution, the importance of using a graupel parameterization, the spin-up of the land surface model, and the nesting strategy. They were performed during four summer months with the COSMO-CLM model. The evaluation was performed using advanced techniques in which modelled precipitation events are evaluated against radar observations in terms of structure, amplitude and location. A first step was to ensure that the evaluation methods allow for a statistically reliable and significant interpretation of the observed differences. Consequently, all experiments were evaluated in order to derive the best setup of the model for convection resolving climate simulations over Belgium.