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Added value and errors ranges: Results from the Convection-Resolving Climate Simulations Intercomparison Project LocMIP

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Parameterizations are one of the major error sources in regional climate model (RCM) simulations. In particular, convective parameterization schemes are causing uncertainties in projected mid European precipitation changes. It has been shown, that convection-resolving simulations, i.e. simulations without convection parameterizations, have the ability to improve the representation of precipitation in numerical weather predictions. Thus, also convection-resolving climate simulations (CRCS) are supposed to have a high potential in decreasing error ranges and uncertainties and in supplying more accurate projections on regional and local scale. However, RCM simulations with grid spacings below 10 km are far from being established. During the Local Climate Model Intercomparison Project (LocMIP) embedded in the Non-Hydrostatic Climate Modelling project (NHCM-1), funded by the Austrian Science Fund, simulations of CCLM, MM5, and WRF (10 km and 3 km grid spacing) driven by the Integrated Forecast System (IFS) of the European Centre for Medium-Range Weather Forecasts (ECMWF) were evaluated and inter-compared over the European Eastern Alpine region for JJA 2007 and DJF 2007/08. In the higher resolved simulations (3 km grid spacing) the convective precipitation schemes were shut down. As reference the Integrated Nowcasting through Comprehensive Analysis (INCA) dataset, provided by the Austrian Central Insitute for Meteorology and Geodynamics (ZAMG), was used which has a 1 km horizontal grid spacing on hourly basis. In particular, a better performance of the 3 km simulations can be found in terms of the spatial root mean square error (RMSE) and the correlation coefficient of the 2 m temperature field, which is mainly caused by a better representation of orography. Additionally, the 3 km simulations are able to produce rainfall with higher intensities. In order to avoid double penalty in evaluation, the fractional skill score (FSS) was applied, showing an improvement of precipitation, especially for intensive summertime rainfall in the CCLM 3 km simulations. Comparing the models, higher developed models (CCLM 4.8 vs. CCLM 4.0, WRF 2.2.1 vs. MM5 3.7.4) generally outperform the older ones. This can be partly drawn back to model improvements and partly to differences in the models' setup. In general, the overall quality of the 3 km simulations strongly depends on the quality of the corresponding 10 km simulations which highlights the importance of reliable lateral boundary conditions. Further analysis (including differences between two focus regions: a hilly area in south-eastern Styria and a mountainous region in the Hohe Tauern national park) will be presented.