Enhanced representation of precipitation using a convection permitting regional reanalyses

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The Hans-Ertel Centre for Weather Research – Climate monitoring branch – has developed a regional reanalysis system for Europe and Germany. The system is based on the operational COSMO-EU and COSMO-DE models and uses a nudging scheme for the assimilation of observational data. The European reanalysis covers the CORDEX EUR-11 domain with a horizontal resolution of 6km (COSMO-REA6) and is available for the twenty year time-period 1995 to 2014. A convection permitting reanalysis system was setup for Germany and the neighboring countries. With a horizontal resolution of 2 km, the model runs without parameterization of deep moist convection. Additional to the nudging of conventional observations, radar-derived rain rates are assimilated using latent heat nudging. Data from COSMO-REA2 is available for the eight year period 2007 to 2014.

The evaluation of the novel reanalysis COSMO-REA2 focuses on precipitation, since here we expect the highest benefit and it plays a critical role in climate monitoring. Extreme precipitation is an important cause of large damages and societal cost in Europe. Long term homogeneous data sets are required to study changes in the frequency and intensities of precipitation events. Convection resolving models are able to adequately simulate the mechanisms leading to high-impact weather, notably heavy precipitation and winds related to deep moist convection. This study illustrates the improved representation of precipitation in a case study and investigates the benefit provided by the convective-scale reanalysis COSMO-REA2.