A high-resolution regional reanalysis for the European CORDEX region

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Within the Hans-Ertel-Centre for Weather Research (HErZ), the climate monitoring branch concentrates efforts on the assessment and analysis of regional climate in Germany and Europe. In joint cooperation with DWD (German Weather Service), a high-resolution reanalysis system based on the COSMO model has been developed.

Reanalyses gain more and more importance as a source of meteorological information for many purposes and applications. Several global reanalyses projects (e.g., ERA, MERRA, CSFR, JMA9) produce and verify these data sets to provide time series as long as possible combined with a high data quality. Due to a spatial resolution down to 50-70km and 3-hourly temporal output, they are not suitable for small scale problems (e.g., regional climate assessment, meso-scale NWP verification, input for subsequent models such as river runoff simulations, renewable energy applications). The implementation of regional reanalyses based on a limited area model along with a data assimilation scheme is able to generate reanalysis data sets with high spatio-temporal resolution.

The work presented here focuses on two regional reanalyses for Europe and Germany. The European reanalysis COSMO-REA6 matches the CORDEX EURO-11 specifications, albeit at a higher spatial resolution, i.e. 0.055° (6km) instead of 0.11° (12km). Nested into COSMO-REA6 is COSMO-REA2, a convective-scale reanalysis with 2km resolution for Germany. COSMO-REA6 comprises the assimilation of observational data using the existing nudging scheme of COSMO and is complemented by a special soil moisture analysis and boundary conditions given by ERA-Interim data. COSMO-REA2 also uses the nudging scheme complemented by a latent heat nudging of radar information. The reanalysis data set currently covers 17 years (1997-2013) for COSMO-REA6 and 4 years (2010-2013) for COSMO-REA2 with a very large set of output variables and a high temporal output step of hourly 3D-fields and quarter-hourly 2D-fields. The evaluation of the reanalyses is done using independent observations for the most important meteorological parameters with special emphasis on precipitation and high-impact weather situations.