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Representation of precipitation in high-resolution regional reanalyses

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Global and regional reanalyses gain more and more importance as a source of meteorological information for many purposes and applications. Dynamical reanalysis systems use a numerical weather prediction model with a fixed data assimilation scheme. The resulting 4-dimensional fields represent our best estimate of the atmospheric state physically consistent in time and space as well as between the meteorological variables. Regional reanalyses allow high spatial and temporal resolutions for a limited area which is important for decision makers on the regional or local level. They provide a valuable homogeneous long-term data set for many meteorological and hydrological variables.

In this study we investigate global and regional reanalyses with different horizontal resolutions and model specifications with respect to their representation of precipitation. Especially for the European domain, several regional reanalysis data sets are available. A comparison with independent observations allows for a quantification of the added value of higher resolutions, convection-permitting model specifications, and the assimilation of radar-derived rain rates. The results show the benefits arising from regional reanalyses compared to coarser gridded data sets and downscaling approaches in representing precipitation and its variability on small temporal and spatial scales.