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Evaluation and uncertainty assessment of precipitation in UERRA regional re-analyses: First results for the Alpine Region and Fennoscandia

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In the last years, research effort has further developed regional deterministic and probabilistic (ensemble) re-analyses with the ambition to derive high-resolution multi-variate climate datasets useful for environmental applications. In UERRA, a FP7 research project of the EU, several regional deterministic and ensemble re-analyses, as well as downscaling procedures based on these re-analyses, are calculated over several decades (30-50 years). An important prerequisite for the appropriate use of these datasets is a quantification of uncertainties and the assessment of their impacts in potential applications.

The aim of the present study is to evaluate daily precipitation data from the new regional re-analyses of UERRA in two topographically complex sub-regions of Europe, namely the European Alps and Fennoscandia. Our focus is on aspects of re-analysis uncertainty that may be relevant for hydrological applications, notably the dependence on spatial scale. The evaluation is based on a comparison against spatial analyses from high-resolution rain-gauge networks. The Alpine rain-gauge dataset, covers territories of seven countries and encompasses more than 5300 daily rain-gauge observations on average. In Fennoscandia, we focus on Norway, Sweden and Finland where a dataset of approximately 2000 daily rain-gauge observations is available. Scale dependence of the uncertainty/accuracy is examined in our analyses by considering (nested) hydrological catchments of variable size and by decomposing precipitation fields into (orthogonal) wavelets of variable scale.

A difficulty for an unbiased evaluation of re-analyses is that reference datasets themselves are subject to uncertainties, the magnitude of which may be significant at the resolution of modern re-analyses and, hence, could affect a scale-dependent evaluation. This difficulty is addressed in the Alpine section of our analysis by introducing a new probabilistic rain-gauge dataset which explicitly quantifies uncertainties by ensembles.

We introduce the concepts and show preliminary results of the evaluation of deterministic (HARMONIE re-analysis produced at SMHI) and probabilistic (re-analysis of the UK Met Office and Ensemble-Nudging data assimilation re-analysis of University of Bonn) re-analyses as well as downscaling (MESCAN - MeteoFrance) datasets against grids and ensemble area-mean precipitation.