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Assessment of high-resolution gridded precipitation data uncertainty in an Alpine catchment

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High-resolution gridded datasets of precipitation (and other meteorological variables) are commonly used for evaluation and downscaling of climate simulations, as well as for regional climate studies. Accordingly, quantifying their uncertainties is essential to assess the quality of the aforementioned applications, especially when future impact studies on water availability and hydrological extremes are involved. The present study is part of the CLIMAWARE (CLIMatic change impacts on future Availability of WAter REsources and hydro- geological risks) project, which focuses on the interactions between climate change, water cycle and human activities related to water in the large Alpine catchment of the river Adige (Italy).
The first step of CLIMAWARE consists in the assessment of the uncertainty of the gridded precipitation datasets available for the study area. Three widely known observational and downscaling gridded datasets of precipitation, i.e. E-OBS v. 12.0 (Haylock et al. 2008), the Alpine Precipitation Gridded Dataset v. 1.2 (Isotta et al. 2014) and MESAN (Häggmark et al. 2000), corresponding to nominal resolutions of $\sim$25, 5 and $\sim$5 km respectively, are compared. A very high-resolution (1 km) regional gridded dataset, based on a high-density weather station network, is adopted as benchmark reference. The comparison of the precipitation (and temperature) data is carried out on monthly and seasonal scale, for the common 20-year period covering the years 1989-2008. Concerning the spatial scale of analysis, both downscaling and upscaling onto the original grids of the different datasets are applied in order to quantify separately the uncertainty associated with the nominal and the effective dataset resolutions. Coarser datasets reveal unfit for applications in the study area, where precipitation spatial variability is particularly high due to the complex orography. Indeed, the different datasets show significant discrepancies in both rainfall amounts and spatial patterns with respect to the reference regional dataset.