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Evaluation of radar-gauge merging methods for quantitative precipitation estimates

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Accurate quantitative precipitation estimates are of crucial importance for hydrological studies and applications. When spatial precipitation fields of high resolution are required, rain gauge measurements are often combined with weather radar observations. In this study, we evaluate several radar-gauge merging methods with various degrees of complexity: from mean field bias correction to geostatistical merging techniques. The area of interest is the Walloon region of Belgium, which is mostly located in the Meuse catchment. Observations from a C-band Doppler radar and a dense rain gauge network are used to retrieve daily rainfall accumulations over this area. The relative performance of the different merging methods are assessed through a comparison against daily measurements from an independent gauge network. A 4-year verification is performed using several statistical quality parameters. The seasonal variations of the relative performance of the methods are assessed as well as the range dependence. The impact of the network density is also investigated. For this purpose, a simple approach to remove gauges from a network is proposed. One of the contributions of this study is to determine the best method for a given network density.