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# Evaluation of radar-gauge merging methods for quantitative precipitation estimates

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Abstract. Accurate quantitative precipitation estimates are of crucial importance for hydrological studies and applications. When spatial precipitation fields are required, rain gauge measurements are often combined with weather radar observations. In this paper, we evaluate several radar-gauge merging methods with various degrees of complexity: from mean field bias correction to geostatistical merging techniques. The study area 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 estimate 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. It appears that the geostatistical merging methods perform best with the mean absolute error decreasing by 40% with respect to the original data. A mean field bias correction still achieves a reduction of 25%. A seasonal analysis shows that the benefit of using radar observations is particularly significant during summer. The effect of the network density on the performance of the methods is also investigated. For this purpose, a simple approach to remove gauges from a network is proposed. The analysis reveals that the sensitivity is relatively high for the geostatistical methods but rather small for the simple methods. The geostatistical merging methods give the best results for all tested network densities and their relative benefit increases with the network density.

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