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A new approach to real-time combination of radar and raingauge data

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Operational hydrological forecast models require near real-time, high-resolution precipitation analyses and forecasts provided at a high update frequency. In order to provide reliable precipitation analyses one needs to combine the advantages of radar data (spatial structure) with those of raingauge data (amount). A new radar/raingauge combination algorithm has been developed as part of the INCA analysis and nowcasting system. Since the correlation between radar and raingauge values is low at short durations (15 min), a number of steps were introduced to preprocess the radar field. These include (i) climatological pre-scaling, (ii) a procedure which allows for a certain spatial mismatch between radar and raingauge values e.g. due to wind drift, (iii) a nonlinear combination method based on the comparison of the latest radar and and raingauge values. It is shown by cross-validation that the resulting INCA precipitation analysis is significantly better than both radar data alone and pure station interpolation in terms of MAE and RMSE. The advantage is most pronounced in convective cases but persists in widespread precipitation events. The sensitivity of the results to assumptions made in the nonlinear combination method is analyzed. Limitations and the potential for further improvement of the method are discussed.