Abstract Estimates of the advection field as derived from successive weather radar images are not only an essential piece of information for precipitation nowcasting, they can also be of value in order to improve the quality of radar-based precipitation estimates themselves. In order to develop a correction scheme for radar accumulations using advection information, three different methods to determine the optical flow between two radar images were tested. The main criteria for algorithm selection were: (a) execution speed to allow application in an operational setting, (b) the quality of the estimated advection field, assessed by visual inspection and common error measures like RMSE and MAE, and (c) the robustness of the algorithm, i.e. the dependence of the estimation quality on the choice of their governing parameters. A simple block matching algorithm, an optical flow algorithm based on image intensity gradients and an approach that uses information on multiple image scales to optimize the search pattern of an extended block matching method were considered. All three methods were reasonably fast for calculating the advection fields and showed a similar distribution of their error measures. The last algorithm showed the most robust behaviour, the estimated advection field being virtually independent of the parameter choice. Applying the accumulation correction scheme using advection fields calculated by this last algorithm, improved the agreement between radar estimates and station measurements for the majority of the stations.

Key words weather radar; advection; optical flow