Optimizing quantitative precipitation estimates using a noncoherent and a coherent radar operating on the same area

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Abstract
A 40 hour period of rainfall during the 1994 Piemonte flood is analysed; data from 69 rain gages were considered as well as 5 min maximum reflectivity maps acquired by an old, noncoherent radar and a “new-generation” Doppler one. The two C-band radars share a similar, hostile radar detection environment: the good view from the radar sites produces severe ground clutter contamination in an adverse orography. Furthermore, we are working at long ranges (distance between radar and gages up to 214 km). The data of both radars have been postprocessed with a texture-based technique for ground clutter removal, because, especially for noncoherent radar data, postprocessing brings a significant improvement. The macroscopic “biases” related to the radar detection environment are reduced using a correction technique based on a weighted, multiple regression. The correction technique requires effective clutter suppression. Best results are obtained by weighing the regression with the total amount of rain estimated by radar. Within the 40 hour observation period the average precipitation measured by the gages is 160 mm. The average of uncorrected radar values at gage locations is about 40 mm only (for both radars). Thanks to the correction procedure, both the underestimation and the normalized standard error are reduced by approximately a factor of 3 (the normalized standard error is defined as the standard deviation between radar and gages divided by the mean radar values at gage locations).