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Evaluation of radar precipitation estimates at a range of time scales and methodologies

E. Morin (1) and E. Bet-Halachmi (2)

(1) Hebrew University of Jerusalem, Geography, Jerusalem, Israel (msmorin@mscc.huji.ac.il), (2) Hebrew University of Jerusalem, Atmospheric Sciences, Jerusalem, Israel

The most common radar-based quantitative precipitation estimation (QPE) methods are based on power-law relationships between the radar reflectivity and the rain rate. This group of methodologies ranges from a constant relation to a relation in which the power-law multiplicative parameter depends on several factors such as distance from the radar, altitude, etc. A different QPE approach is the window probability matching method (WPMM) that is based on matching quantiles of reflectivity and rain rates. The two approaches require rain gauge data that allow deriving the power-law parameters in the first case and the rain rate quantiles in the second. Moreover, the WPMM method requires rain rate data while for the power-low approach the more common rain accumulation data (e.g., daily data) are sufficient.

In the current study we evaluate radar-based QPE derived by the two approaches for five year record (1999/00-2003/04) in two study areas in Israel: the northern coastal area (7 rain gauges) and the southern coastal area (4 rain gauges). The first three years are used for calibration, i.e. deriving the power-law parameters and the quantiles, and the following two years are used for validation and for assessment of the QPE accuracy. The accuracy of the derived QPE is evaluated for a range of time scales from 30 minutes to daily using root mean square difference (RMSD) and bias criteria.

We have found that the WPMM is superior to the power-law method for the two studied regions and for all time scales examined. Depends on the power-law method used, the improvement achieved by the WPMM may be small (less than 3%) or large (20-26%) in terms of RMSD. This improvement slightly depends on time scale at which the data are considered. The study further compares the different methodologies and the conditions under which a given method is superior over the others.