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Accuracy of X-Band and C-Band radar rainfall estimates in a Mediterranean to arid transition area

Francesco Marra (1), Anton Lokshin (2), Riccardo Notarpietro (3), Marco Gabella (4), Marco Branca (3), David J. Bonfil (5), and Efrat Morin (1)

(1) Hebrew University of Jerusalem, Geography, Israel (marra.francesco@mail.huji.ac.il), (2) Hydrology and Water Resources Program, Hebrew University of Jerusalem, (3) Electronics and Telecommunication Department, Politecnico di Torino, (4) MeteoSwiss, (5) Department of Vegetable and Field Crop Research, Agricultural Research Organization

Weather radars are able to provide rainfall estimates with high spatial and temporal resolutions. Accuracy of rainfall estimates is a key factor when dealing with hydrological applications such as hydrological modeling, in particular for real time applications, for instance flood and flash-flood warning systems. Small X-Band weather radars are relatively cheap and easy to be handled and maintained and are therefore object of particular interest. The drawback of these instruments lies on the quantitative accuracy, that can be significantly decreased by attenuation problems.

Two small X-Band weather radars are operational since 2012/2013 in the Be'er Sheva area (Israel), covering an interesting region prone to floods and flash floods. The climate regime of the area varies from Mediterranean to arid, with a mean annual precipitation decreasing sharply from 500 to 100 mm/yr in about 50 km distance, from the Mediterranean to the Dead sea. The area is also covered by two C-Band radar-meteorological instruments, located at 50-100 km, close to Tel Aviv. The objective of this study is to assess the quantitative accuracy of the related rainfall estimates.

Radar quantitative precipitation estimates (QPE) are produced both from X-band and C-band radars. Radar data are processed, aiming to reduce the errors due to wet radome attenuation, beam blockage, beam attenuation and vertical profile of reflectivity, using physically based correction algorithms; average rainfall amounts are adjusted to remove the mean field bias with respect to ground measurements. Gauge-denial situations are also explored using the biased QPE scenarios. Accuracy of the obtained radar QPEs is assessed by statistical comparison with ground based measurements and results are presented for a set of storm events that impacted the area during 2013-2014 rain season.