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Testing the performance of radar rainfall algorithms for different rain events in Turkey

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Weather radars are capable of estimating quantitative precipitation in very short period of time. These instruments estimate rainfall rate by employing empirical reflectivity-rainfall rate (Z-R) relationships or polarimetric algorithms. Nevertheless, as weather radars suffer from hardware and software related problems, beam geometry, topography, environment or atmospheric conditions, rainfall estimates may vary from ground based rain observations. On the other hand, reliable ground observation is one of the most challenging questions for radar QPE studies. Statistical improvements to radar rainfall measurements can only be successful if ground observations are reliable. TSMS has installed 50 observation test sites and each site has triple collocated rain gauges. A field campaign project has also been designed and two networks have been constituted by TSMS in the area of which is intersection of single/dual radars and dual/dual radars. Each site consists of three collocated TRwS205 weighing rain gauges, one Theis disdrometer and a high resolution camera to record and visualize the type and duration of the precipitation. In this study, some Z-R relationships in the literature, some disdrometer based Z-R relationships and polarimetric algorithms are compared for 23 different convective and stratiform cases in Turkey. Looking at the statistical analysis, polarimetric algorithms work well for the all convective cases and the most of the best results come from R(K_{DP}) (18 of 21 convective cases). However, for single polarization radars, empirical R(Z) in the literature or those coming from disdrometers can only be used to estimate rainfall. As expected, Marshall-Palmer gives the best result for startiform cases, however disdrometer based Z-R relationship can be employed instead if it is available. Results also indicated that employing disdrometer based Z-R is relatively better than employing Marshall-Palmer or other relationships in the literature even though the best results are obtained from polarimetric equations. The statistics of neighboring pixels are also taken in the account to understand the variability of convective or stratiform rain in a small-scale area.