EGU2020-18780
https://doi.org/10.5194/egusphere-egu2020-18780
EGU General Assembly 2020

Production of a High-Resolution Improved Radar Precipitation Estimation Map Using Gauge Adjustment Bias Correction Methods

Kaveh Patakchi Yousefi[1], M. Tuğrul Yılmaz[2], Kurtuluş Öztürk[3], İsmail Yücel[4], and Koray K. Yılmaz[5]
[1]Middle East Technical University, Civil Engineering, Ankara, Turkey (kaveh.yousefi@metu.edu.tr)
[2]Middle East Technical University, Civil Engineering, Ankara, Turkey (tuyilmaz@metu.edu.tr)
[3]General Directorate of Meteorology, Remote Sensing Department, Ankara, Turkey (kozturk@mgm.gov.tr)
[4]Middle East Technical University, Civil Engineering, Ankara, Turkey (iyucel@metu.edu.tr)
[5]Middle East Technical University, Geology Department, Ankara, Turkey (yilmazk@metu.edu.tr)

This study evaluates relative performances of different statistical algorithms to enhance radar-based quantitative precipitation estimation (QPE) accuracy using rain gauge network data. Initial investigations are implemented using observations obtained via 17 C-band radars located over different regions of Turkey. It was observed that there is an underestimation problem in radar estimations compared with the ground observations. According to the initial results, daily mean bias for radar estimations over different precipitation events is about -1.4 mm/day in average. Implemented statistical methodologies include Mean Field Bias (MFB), Local Multiplicative Bias (LMB), Local Additive Bias (LAB), Local Mixed Bias (LMIB), Multiple Linear Regression (MLR) adjustment, and Cumulative Distribution Function (CDF) Matching techniques. To test the performance of these algorithms, cross-validation methods have been used. In cross-validation, 50%, 25%, 12.5% of the station-based observations are excluded for validation while the remaining are used for the calibration in different experiments. Both the calibration and validation results obtained from all rainfall events of 2017 suggest that LMB and LAB adjustment methods perform better both in terms of compensating the underestimation and decreasing the RMSE values. Primary results show that methods mentioned help reduce the underestimation problem by increasing the daily mean error from -1.4 mm up to -0.4 mm and decreasing the daily RMSE values from 6.2 mm/day to 0.80 mm/day in rainy days in average. Despite the fact that proposed time-independent MLR and CDF methods are shown to be compensating a large portion of radar precipitation underestimation (according to the initial results, from -1.4 mm/day into -0.5 mm/day in average), estimations obtained from these methods have higher uncertainties in estimating the precipitation amount especially in areas with higher probability of convective precipitation type (no significant increment in RMSE values). By utilizing the best methods among all bias adjustment methods, a high-resolution composite radar-based precipitation map of Turkey is currently being produced. For validating the final product, three independent networks of collocated rain-gauges will be used. Similar results are being expected from the final validation process. Nevertheless, the outputs of this validation process will help understand the relative performance of the bias correction algorithms in the areas with overlapping radar estimations.

Keywords — Merging, radar precipitation estimation, gauge adjustment