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Evaluating the use of radar precipitation data in simulating a flood event in Terme, Samsun-Turkey

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Floods caused by convective storms in mountainous regions are sensitive to the temporal and spatial variability of rainfall. In developing countries, researches and authorities working on this issue have to deal with lack of data. Space-time estimates of rainfall from weather radar can be a remedy to represent pattern of the rainfall with some inaccuracy. However, there is a strong need for evaluation of the performance and limitations of these estimates in hydrology. This study aims to provide a comparison of gauge and radar rainfall data sources during an extreme flood event (22.11.2014) lasting 40 hours. For this study, hourly rainfall data from 13 ground observation stations were used in the analyses. This event created 541 m^3/sec peak discharge at the 22-45 discharge observation station and flooding at the downstream of Terme Basin. Comparisons were performed in two parts. Firstly, before forming the model, datasets were analyzed in areal and point based manner. Secondly, The HEC-HMS model was used to assess the accuracy of the rainfall datasets to simulate river flows for the flood event. Kalman Filtering was used in the bias correction of radar rainfall data compared to gauge measurements. Radar, gauge and corrected radar data were used as model inputs. Results in point comparisons indicated that, trend of the rainfall is captured by the radar rainfall estimation well but radar underestimates the maximum values. Moreover, it was observed that the assessment factor (gauge rainfall/ radar rainfall estimation) does not depend on the distance between radar and gauge station. On the other hand, in areal based comparisons, results in all computations showed that the proximity of the sub-basin to the radar location is significant for accuracy. According to cumulative gauge value, radar underestimated the cumulative rainfall amount by % 32. In flood modeling part, it was seen that radar-based flow predictions demonstrated good potential for successful hydrological modeling. Moreover, flow predictions obtained from bias corrected radar rainfall values produced an increase in the peak flows compared to the ones obtained from radar data itself.