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Evaluating the use of different precipitation datasets in flood modelling

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Satellite based precipitation products, numerical weather prediction model precipitation forecasts and weather radar precipitation estimates can be a remedy for gauge sparse regions especially in flood forecasting studies. However, there is a strong need for evaluation of the performance and limitations of these estimates in hydrology. This study compares the Hydro-Estimator precipitation product, Weather Research and Forecasting (WRF) model precipitation and weather radar values with gauge data in Samsun-Terme region located in the eastern Black Sea region of Turkey, which generally receives high rainfall from north-facing slopes of mountains. Using different statistical factors, performance of the precipitation estimates are compared in point and areal based manner. In point based comparisons, three matching methods; direct matching method (DM), probability matching method (PMM) and window correlation matching method (WCMM) are used to make comparisons for the flood event (22.11.2014) lasted 40 hours. Hourly rainfall data from 13 ground observation stations were used in the analyses. This flood event created 541 m3/sec peak discharge at the 22-45 discharge observation station and flooding at the downstream of the basin. It is seen that, general trend of the rainfall is captured by the radar rainfall estimation well but radar underestimates the peaks. Moreover, it is observed that the assessment factor (gauge rainfall/ radar rainfall estimation) does not depend on the distance between radar and gauge station. In WCMM calculation it is found out that change of space window from 1x1 type to 5x5 type does not improve the results dramatically. In areal based comparisons, it is found out that the distribution of the HE product in time series does not show similarity for other datasets. Furthermore, the geometry of the subbasins, size of the area in 2D and 3D and average elevation do not have an impact on the mean statistics, RMSE, r and bias calculation for both radar and HE data. The poorest results in mean statistics are observed for HE precipitation product with respect to other datasets. Proximity of the subbasin to the radar location gives better results in all computations. According to cumulative gauge value, the HE product and the radar underestimate cumulative rainfall amount by % 71 and % 32 respectively.