



Bias Correction of Satellite Precipitation Products based on Concept of Copula

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Unlike gauges and radars, satellite measurements can overcome limitations from ground sensors in terms of spatio-temporal coverage and operational utilities, but due to the uncertainty of satellite estimates, the products should be evaluated. In addition, the uncertainty of data is dependent on the spatial scale and time accumulation of the estimation. In this study, we present a bias correction approach based on satellite-based daily precipitation estimates using the concept of copulas over the northeast of Austria. An ensemble of error adjustment satellite precipitation estimate of any given daily non-zero event is simulated by imposing copula-based randomly generated error fields over the original satellite precipitation estimate of the same event. Thus, for 47 selected daily events, a set of 47 ensembles are simulated, each of which consists of a large number of realizations. Each realization represents a possible daily precipitation event that may occur over the study domain. It is notable that in the presented Copula-based model, instead of fitting a standard distribution function to the data, the empirical CDF of observed error is applied to the uniformly simulated error values so that simulated error values will have the same CDF as that of observed. Then the best-simulated ensemble was employed to validate the performance of the model for some other daily events, which did not participate in the simulation.

It was found that the accuracy of GPM-IMERG precipitation estimates improved after bias correction. Based on Bias and RMSE error indices, the results indicated an acceptable improvement and model extracted the errors more cleanly and produced a superior estimation of the error characteristics. However, the overall spatial dependence structure of observed errors is reasonably preserved as that of the generated errors. Also, the validation results implied that the simulated realizations error-adjusted band encompassed the observed data reasonably. Overall, by using the Gaussian copula-based model, one may generate multiple realizations of precipitation fields through the simulation of error fields based on the observed error values.