

A new point-to-object method to evaluate the IMERG precipitation product from the precipitation system perspective

Abstract

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One of the great advantages of satellite precipitation estimates is that they can obtain complete pictures of precipitation systems globally, which is hard to achieve by the scatter gauge data or the limited ground radar data. This advantage greatly enhances our understanding of precipitation in nature. Also, for this reason, understanding the precipitation system-based bias in satellite products with a direct ‘object-to-object’ method by ground reference data is hard to realize. To solve this issue, we develop a broader applicable method, namely a ‘point-to-object’ method that regards the discrete gauges as sampling points to evaluate the satellite precipitation systems. 55879 AWSs with hourly observation in China are used to investigate the IMERG performance from the precipitation system perspective. Our results show that the smaller the satellite precipitation systems are, the higher the false alarm proportion inside them, the lower miss proportion outside them, and the more underestimated precipitation rate are. The miss and false alarm proportions near the precipitation system boundaries are much larger than that far away from the boundaries, while the precipitation rate bias presents negative to positive to negative bias from the boundaries to the centers. These indicate the strong influence of precipitation system scale and organization structure on satellite precipitation bias which could be further attributed to different precipitation dynamics.

A universal overestimation of precipitation system size is revealed, which is severer for small ones than large ones, for the afternoon than morning. The different data sources of IMERG in a day evidently influence the description accuracy of precipitation system size in one day.

