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Error characterisation of satellite-based precipitation products over India

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Satellite-based Precipitation Products (SPP) in which the precipitation is computed indirectly by satellite sensor measurements, have become an important alternative precipitation data resource. SPPs are available at high spatio-temporal resolution and quasi-global or global coverage, thereby making it an adequate substitute for the traditional gauge-based observations. However, being indirect precipitation estimates, SPPs are often associated with bias and error, which may be inherently introduced in them from multiple sources such as sensor measurement, retrieval algorithm, spatial and temporal sampling, etc. The quality of SPPs needs to be analyzed and the resulting error needs to be characterized for useful application of these datasets. In this study, we characterize the error of six different SPPs (TRMM 3B42, TRMM 3B42RT, CMORPH Raw, CMORPH Corrected, CHIRPS, PERSINANN) into systematic and random components using Willmott decomposition technique over monsoon dominated region of India for 12 years (2002-2013) duration. Gridded daily rainfall dataset at $0.25^\circ \times 0.25^\circ$ spatial resolution, released by the India Meteorological Department (IMD) is used as the reference dataset to evaluate the SPPs. The results of the study indicate that in the majority of SPPs, the major contribution is from random error component, when compared with the systematic component. Moreover, systematic error component is observed to be proportional to rainfall intensity. The North-Eastern and northern parts of India show maximum systematic error and minimum random error. The results of the present study highlight the need for uncertainty reduction and bias correction of various SPPs over India.