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Performance of the GSMaP data over Vietnam and a case study of its correction by using artificial neutral networks

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The performance of the Global Satellite Mapping of Precipitation data (GSMaP - MVK version 5.222.1) is examined by comparing with the rainfall gauged at 57 meteorological stations of Vietnam and the gridded Asian Precipitation - Highly-Resolved Observational Data Integration Towards Evaluation of Water Resources data (APHRODITE - V1003R1). Results show that correlation coefficients between GSMaP and rain-gauge observations for the period of 2001-2007 are commonly in the [-0.3,0.6] range, which are significantly lower compared to the [0.7,0.99] range of the APHRODITE data. The lowest correlated regions for GSMaP are located mainly in the coastal zone of Central Vietnam. An EOF analysis of the datasets shows that GSMaP well represents the first two principal rainfall regimes for Vietnam consisting of the May-October regime in North Vietnam and in the west side of the TruongSon mountain range; and the September-November rainfall regime in Central Vietnam. The first and the second eigenmodes of GSMaP respectively explained 83.95% and 11.12% of rainfall variances, which are in good agreement with APHRODITE. Both GSMaP and APHRODITE show topographic effects, which result in more precipitation in the windward side of the TruongSon mountain range during both summer and winter monsoon seasons. However, GSMaP largely underestimates the topographic effects on winter monsoon rainfall, particularly in the coastal zone of Central Vietnam. A case study of GSMaP correction by using artificial neutral networks (ANN) is implemented over the ThuBon-VuGia basin in Central Vietnam. Validation results through spatial correlation, amplitude and Nash?Sutcliffe efficiency coefficient show that the ANN correction method significantly improves the GSMaP rainfall quality over the basin for both the dependent and independent periods of 2001-2005 and 2006-2007, respectively.

Keywords: GSMaP, satellite rainfall, artificial neutral network, winter monsoon