Journal of the Meteorological Society of Japan, (accepted, in press)

SPATIOTEMPORAL EVALUATION OF THE GAUGE ADJUSTED GLOBAL SATELLITE MAPPING OF PRECIPITATION AT THE BASIN SCALE,

Kentaro Takido, Oliver Saavedra Valeriano, M. Ryo, K. Tanuma, T. Ushio and T. Kubota

Abstract

This study evaluated the accuracy of gauge adjusted Global Satellite Mapping of Precipitation (GSMaP_Gauge version V5.222.1, hereafter G_Gauge) data in Japan's Tone River basin during 2006–2009. Specifically, the accuracy of a gauge non-adjusted product, GSMaP Moving Vector with Kalman Filter (GSMaP_MVK, hereafter G_MVK), was compared. Both products were also evaluated against ground observation data from the local rain gauge-radar combined product Radar/Raingauge-Analyzed Precipitation (Radar-AMeDAS, hereafter R-AMeDAS) in terms of temporal and spatial variability. Temporal analyses showed G_Gauge had better accuracy than G_MVK at sub-daily time scales (1, 3, 6, 9, 12, and 24 hrs) within any range of precipitation intensity and better detection capabilities of rainfall event. Linear regressions with Radar-AMeDAS showed better performance for G_Gauge than G_MVK at any time scales in terms of Pearson's correlation coefficient and the slope of regression. At hourly scale, in particular, Pearson's correlation coefficient for G_Gauge (0.84) was higher than that for G_MVK (0.72) as well as the slope of linear regression (0.87 and 0.65, respectively). The probability of detection (POD) improved from 0.48 (G_MVK) to 0.70 (G_Gauge) when gauge adjusted data were used. However, spatial analysis detected that G_Gauge still underestimated the precipitation intensity in high elevation regions and slightly overestimated it in low elevation regions. The POD and false alarm ratio (FAR) had a linear relationship with log-transformed elevation data ($R2 > 0.4$), and the relationships were stronger in the winter seasons than the summer seasons. For further improvements of the GSMaP product, we suggest including local gauge-calibrated ground radar dataset to enhance accuracy at the basin scale. At any spatial and temporal scale, the evaluation of these products should consider seasonal changes (especially in winter) and the topographic effects.

Keywords: GSMaP_Gauge; GSMaP_MVK; satellite precipitation; data accuracy; Tone River