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Validation of satellite precipitation product GSMaP/NRT with ground rain gauges in Cambodia

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The Global Satellite Mapping of Precipitation Near Real Time data (GSMaP/NRT) is one of the satellite precipitation datasets which is produced by Japan Aerospace Exploration Agency with time resolution of 1 hour and spatial resolution of 0.1 degrees. Since it is published approximately 4 hours after the observation, it is expected to contribute to the early warning of floods and water resource management in developing countries as well which have poor ground observation network. Our target area, Cambodia in the Indochina Peninsula, is one of such countries. However, there had been few ground rain gauges so that it had been impossible to validate GSMaP/NRT. Thus, the accuracy of GSMaP/NRT in this area had been unclear. One of the major characteristics of this area is that it has a vast lake area with water surface temperature of more than 30 degrees all year round. With this lake surface, it has been relieved that a unique local atmospheric circulation and its associated precipitation occur in this area. In order to validate the rainfall amount in this area, we rehabilitated and newly installed rain gauges. As a result, we have 34 automatic rain-gauges now and data is available from September 2009. Using this data as well as hourly rainfall amount from GSMaP/NRT and brightness temperature (TB) from Multi-functional Transport Satellite Infrared 1 channel (MTSAT/IR1), we analyzed the error tendency of the GSMaP/NRT product.
The analysis showed that the relationship between rain gauges and GSMaP/NRT were very poor. Especially, strong rainfall events in full-monsoon season over land with 208K < TB < 253K and those in post-monsoon season over the lake with TB < 208K were very much underestimated by GSMaP/NRT. The results suggest that it is still difficult to use GSMaP/NRT data for hydrological applications to get soil moisture distribution and river discharge in this area, especially at small river basins.
In addition, although many rainfall events were produced by GSMaP/NRT when TB < 208K in full-monsoon season, almost no rainfall were actually recorded by rain gauges. Most of the rainfall events in full-monsoon season were found to be occurred under TB > 208K, sometimes even TB > 273K, but rainfalls with TB > 253K were poorly captured by GSMaP/NRT.
When we take 720-hour ($\sim$1-month) -moving-average, post-monsoon rainfall with 253K < TB < 273K over and around the lake has almost linear relationship between the two and the slope is about 1. This tendency can be used to assess the available water resources and grasp the climatological characteristics.