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Estimation of Seasonal Actual Evapotranspiration through Optical Satellite Imagery

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Abstract

Evapotranspiration (ET) is an important component of water balance, but its quantification at large spatial scales is not a simple task. Since the last two decades, many retrieval algorithms using optical satellite imageries were developed to estimate spatially distributed actual ET at regional scale, which is shown to be effective in agricultural areas with irrigated upland crops. To date, it is not known whether these algorithms also work well for areas under irrigated lowland rice in the tropics. Lowland rice is grown under continuously flooded conditions, which may affect the accuracy of retrieval algorithms.

In this study, the Surface Energy Balance Algorithm for Land (SEBAL) was used to estimate seasonal actual ET from irrigated lowland rice in District 1 of the Upper Pampanga River Integrated Irrigation System (UPRIIS) in Central Luzon, Philippines. Two ASTER images and seven MODIS images from the wet season of 2000 were used to compare the seasonal actual ET at five different scales within an irrigation system. The required ground truth for implementation of the SEBAL algorithm was obtained at each satellite overpass. To evaluate the estimated seasonal ET, data from weather stations in the area were collected and used to quantify seasonal ET. A close relationship between the seasonal actual ET values derived from remote sensing data using SEBAL and the values calculated from the weather stations were observed. It is concluded that seasonal actual ET rates can be accurately estimated by integrating ASTER and MODIS images at different spatial scales from lowland rice in the tropics.

Keywords: Actual evapotranspiration, ASTER, MODIS, Philippines, remote sensing, UPRRIS

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