**A New Data Fusion Algorithm for Reservoir Remote Sensing**

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**Abstract**

Near realtime reservoir storage information is essential for accurate flood monitoring and prediction, especially over data sparse regions and international river basins. Although the combined use of elevation values from radar altimetry instruments and water area values from optical bands offers promise for estimating reservoir storage variations from space, the altimeter’s long return period and the optical sensor’s constrains to cloud-free conditions has inhibited applications which require high temporal resolution data. In this study, a new algorithm is developed to estimate reservoir surface area by fusing passive microwave and optical observations. The daily horizontal brightness temperatures at 36.5 GHz and 0.25° resolution are collected from the Advanced Microwave Scanning Radiometer–Earth Observing System (AMSR-E on NASA’s Aqua satellite). By calibrating against area estimations from the Moderate Resolution Imaging Spectroradiometer (MODIS) from 2003 to 2007, a set of weighting parameters are identified for each AMSR-E grid cell over the reservoir and in its vicinity. These parameters are then applied to the AMSR-E data to calculate surface area from 2008 to 2010. Storage variations are then inferred from the area and a pre-determined area-elevation relationship. For validation, the derived reservoir storage time series are compared with gauge observations over four reservoirs in South Asia. It is found that the storage results are highly correlated with observations (with R2 values ranging from 0.62 to 0.83 for the 16-day results, and from 0.52 to 0.66 for the 4-day results). This suggests that the data fusion algorithm developed in this study can be used for deriving reliable reservoir storage estimations under all weather conditions.