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Mapping reservoir water quality with the spaceborne Formosat-2 multi-spectral imagery and the airborne Intelligent Spectral Imager System hyper-spectral imagery

C.-H. Chang (1), C.-C. Liu (1,2,3), H.-Y. Hsu (3), L.-J. Lee (4), T.-M. Huang (4), C.-G. Wen (5,6)

(1) Earth Dynamic System Research Center, National Cheng Kung University, Tainan, Taiwan, R.O.C. (chihhua@mail.ncku.edu.tw/886-6-2740285), (2) Department of Earth Sciences, National Cheng Kung University, Tainan, Taiwan, R.O.C. (ccliu88@mail.ncku.edu.tw/886-6-2740285), (3) Institute of Satellite Informatics and Earth Environment, National Cheng Kung University, Tainan, Taiwan, R.O.C., (4) Instrument Technology Research Center, National Applied Research Laboratories, Hsinchu, Taiwan, R.O.C., (5) Department of Environmental Engineering, National Cheng Kung University, Tainan, Taiwan, R.O.C., (6) Sustainable Environmental Research Center, National Cheng Kung University, Tainan, Taiwan, R.O.C.

The reservoir is the primary source of freshwater for most of the cities around the world. Therefore, an effective and reliable method for monitoring the water quality of a reservoir is crucial to meet the basic requirement of human beings. Progressing in remote sensing technology has enabled the observations of ocean color to be made from space, which can be used to retrieve the concentrations of chlorophyll-a (Chl-a), total suspended matter (TSM) and colored dissolved organic matter (CDOM). The limited spatial and spectral resolutions of the existing spaceborne ocean color sensors, however, are inappropriate for monitoring the reservoir water quality. Therefore, this research attempts to investigate the feasibility of mapping the reservoir water quality with the data collected from the other remote sensing platforms, such as the spaceborne Formosat-2 multi-spectral imagery and the airborne Intelligent Spectral Imager System (ISIS) hyper-spectral imagery. Several field campaigns synergic with Formosat-2 or ISIS image acquisitions were conducted in Tseng-Wen Reservoir (TWR). The remotely-sensed water qualities were retrieved by applying both the empirical and semi-analytical algorithms to process the Formosat-2 and ISIS images, respectively. The results were evaluated by comparing to the *in-situ* data. The results indicate that the time series of Chl-a derived by the empirical algorithm and multi-temporal Formosat-2 images fit well with the monthly Chl-a variability of TWR. By employing the semi-analytical ocean color algorithm to process the hyper-spectral images, the retrieval accuracy is much improved and the extra water quality parameters can be obtained. For example, both TSM and CDOM can be accurately derived from the ISIS images. This research demonstrates that the airborne ISIS hyper-spectral images have potential in integrating with the existing approaches to monitor the water quality of TWR. In addition, the multi-temporal images taken by Formosat-2 serve as a good supplementary to assist us to gain a better understanding of the reservoir water quality trends.