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Inland-coastal water interaction: Remote sensing application for shallow-water quality and algal blooms modeling

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Abstract

In this study, Landsat 8 and Sea-Viewing Wide Field-of-View Sensor (SeaWIFS) sensors were used to model the spatiotemporal changes of four water quality parameters: Landsat 8 (turbidity, chlorophyll-a (chl-a), total phosphate, and total nitrogen) and Sea-Viewing Wide Field-of-View Sensor (SeaWIFS) (algal blooms). The study was conducted in Florda bay, south Florida and model outputs were compared with in-situ observed data. The Landsat 8 based study found that, the predictive models to estimate chl-a and turbidity concentrations, developed through the use of stepwise multiple linear regression (MLR), gave high coefficients of determination in dry season (wet season) (R2 = 0.86(0.66) for chl-a and R2 = 0.84(0.63) for turbidity). Total phosphate and TN were estimated using best-fit multiple linear regression models as a function of Landsat TM and OLI,127 and ground data and showed a high coefficient of determination in dry season (wet season) (R2 = 0.74(0.69) for total phosphate and R2 = 0.82(0.82) for TN). Similarly, the ability of SeaWIFS for chl-a retrieval from optically shallow coastal waters by applying algorithms specific to the pixels' benthic class was evaluated. Benthic class was determined through satellite image-based classification methods. It was found that benthic class based chl-a modeling algorithm was better than the existing regionally-tuned approach. Evaluation of the residuals indicated the potential for further improvement to chl-a estimation through finer characterization of benthic environments.

Key words: Landsat, SeaWIFS, water quality, Florida bay, Chl-a, turbidity