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**Estimating chlorophyll-a concentration in inland, estuarine and coastal waters: from close range to satellite observations**

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The objective of this work was to test the performance of a recently developed three-band model and its special case, a two-band model, for the remote estimation of the chlorophyll-a (chl-a) concentration in turbid productive case 2 waters. We specifically focused on (a) determining the ability of the models to estimate chl-a concentration below 20 mg m-3, typical for estuarine and coastal waters, and (b) assessing the potential of MODIS and MERIS to estimate chl-a concentrations, using red and near-infrared (NIR) bands. Reflectance data were collected in inland, estuarine, and coastal waters by hyperspectral radiometers just beneath the water surface, hyperspectral imaging sensor AISA on board an aircraft, and satellite sensors MODIS and MERIS. Algorithms established using proximal sensing were applied to aircraft and satellite data. The algorithms yielded high accuracy in estimating chl-a concentrations from AISA and MERIS data. The results illustrated the potential of the NIR-Red models to estimate chl-a concentration in turbid productive waters with a high accuracy. Nevertheless, challenges still remain in calibrating the models for their universal application to satellite data. The in situ data collection technique needs to be adapted to maximize the number of stations that can be assessed with a single satellite image. The spatial heterogeneity of the water within a satellite pixel area around each station needs to be accounted for. So are any changes in the bio-physical and bio-optical characteristics of the water at each station during the time elapsed between the satellite overpass and the in situ data collection. Accurate and reliable atmospheric correction of the satellite data is still a major challenge for turbid productive waters. Provided these factors can be effectively accounted for, robustly calibrated algorithms can be developed for real-time estimation of chl-a concentration, which will greatly benefit scientists and natural resource managers in making informed decisions on managing the inland, estuarine, and coastal ecosystems.

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