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TITLE: Operational NIR-red Algorithms for Estimating Chlorophyll-a Concentration in Coastal Waters – The Azov Sea Case Study

ABSTRACT BODY: We present here results that strongly support the use of MERIS-based NIR-red algorithms as standard tools for estimating chlorophyll-a (chl-a) concentration in turbid productive waters. The study was carried out as one of the steps in testing the potential of the universal applicability of previously developed NIR-red algorithms, which were originally calibrated using a limited set of MERIS imagery and in situ data from the Azov Sea and the Taganrog Bay, Russia, and data that were synthetically generated using a radiative transfer model. We used an extensive set of MERIS imagery and in situ data collected over a period of three years in the Azov Sea and the Taganrog Bay for this validation task. We found that the NIR-red algorithms gave consistently highly accurate estimates of chl-a concentration, with the root mean square error as low as 5.92 mg m-3 for the two-band algorithm and 5.91 mg m-3 for the three-band algorithm for the dataset with chl-a concentrations ranging from 1.09 mg m-3 to 107.82 mg m-3. This obviates the need for case-specific reparameterization of the algorithms, as long as the specific absorption coefficient of phytoplankton in the water does not change drastically, and presents a strong case for the use of NIR-red algorithms as standard algorithms that can be routinely applied for near-real-time quantitative monitoring of chl-a concentration in the Azov Sea and the Taganrog Bay, and potentially elsewhere, which will be a real boon to ecologists, natural resource managers and environmental decision-makers. We also present a temporal series of chl-a maps generated using the NIR-red algorithms from images acquired by the space-borne hyperspectral sensor HICO over the Taganrog Bay. The fine spatial resolution (96 m) of HICO images allows for a detailed analysis of the spatial distribution pattern of chl-a, and the fine spectral resolution (5.7 nm) offers a great potential for phytoplankton species discrimination. With the recent demise of MERIS, HICO presents itself as a suitable alternative tool for continual remote monitoring of the Azov Sea and Taganrog Bay regions until the launch and operation of the Ocean Land Colour Instrument (OLCI) onboard Sentinel-3, which is scheduled to be launched in 2014. OLCI has all of MERIS' spectral bands and the NIR-red algorithms are expected to yield chl-a estimates of similar accuracies from the OLCI data as from the MERIS data.

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