A robust $K_d(490)$ algorithm for remote sensing of optically complex waters

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We developed and compared different empirical and semi-analytical algorithms for optically complex waters to retrieve the diffuse attenuation coefficient of downwelling irradiance (K_d(490)) and tested them against an independent data set, in order to ultimately suggest a robust algorithm that is valid for optically complex water bodies with high concentrations of CDOM.

In the first approach, developed by [1], revisited by [2], K_d(490) was estimated from the empirical relation between K_d(490) and the ratio of remote-sensing reflectances at two wavelengths within the visible spectrum. Due to MERIS characteristics, several bands in the longer wavelengths (560, 620, 660, 710 nm) were available to retrieve better reference conditions over CDOM dominated coastal waters. Various sets of band ratios were tested to achieve the best estimate for K_d(490) where reflectance data was retrieved either using MERIS standard algorithms (MEGS) or an alternative processor for atmospheric correction and water quality parameters (FUB WeW). In the second approach, K_d(490) was expressed as a function of inherent optical properties (IOP) after the algorithms by [3] and [4]. The IOPs needed as an input for these algorithms were retrieved from MERIS level 2 products (algal_2, total_susp and yellow_subs) or taken from the literature.

We compared the MERIS derived K_d(490) values by various algorithms with values measured in optically complex coastal waters in the Baltic Sea which showed relatively good estimates in case of both methods. The results indicate that for empirical algorithm, the RMS (%) decreases and the coefficients of determination (R^2) increases while using the longer wavelengths in the visible spectrum for the reference band. We found that the best estimates were retrieved by using the ratio of MERIS bands $R_{rs}(490)/R_{rs}(710)$, which provides a promising approach (RMS 14%, R^2=0.98, N=14) for estimating K_d(490) over wide range of values (0.2 - 2.5m^{-1}).

References

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