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Modelling the light absorption coefficients of oceanic waters: Implications for underwater optical applications

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Abstract: Spectral absorption coefficients of particulate (algal and non-algal components) and dissolved substances are modelled and combined with the pure seawater component to determine the total light absorption coefficients of seawater in the Bay of Bengal. Two parameters namely chlorophyll-*a* (*Chl*) concentration and turbidity were measured using commercially available instruments with high sampling rates. For modelling the light absorption coefficients of oceanic waters, the measured data are classified into two broad groups – algal dominant and non-algal particle (*NAP*) dominant. With these criteria the individual absorption coefficients of phytoplankton and *NAP* were established based on their concentrations using an iterative method. To account for the spectral dependence of absorption by phytoplankton, the wavelength-dependent coefficients were introduced into the model. The *CDOM* absorption was determined by subtracting the individual absorption coefficients of phytoplankton and *NAP* from the measured total absorption data and then related to the *Chl* concentration. Validity of the model is assessed based on independent *in-situ* data from certain discrete locations in the Bay of Bengal. The total absorption coefficients estimated using the new model by considering the contributions of algal, non-algal and CDOM have good agreement with the measured total absorption data with the error range of 6.9 to 28.3%. Results obtained by the present model are important for predicting the propagation of the radiant energy within the ocean and interpreting remote sensing observation data.