Removing the Ambiguity Associated with the Attenuation Coefficient Products Derived From Satellite Ocean-color Measurements

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Abstract: The attenuation coefficient of downwelling irradiance at 490 nm (Kd490) is a standard product for ocean color missions. Presently, the Kd490 product is produced through an empirical relationship which uses the ratio of remote sensing reflectance (Rrs) at 489 nm and 555 nm (for SeaWiFS) as inputs. In addition, as evaluation product, the attenuation coefficient of the photosynthetic available radiation (PAR), Kd(PAR), is also derived for MODIS and SeaWiFS sensors; and the algorithm for Kd(PAR) is in a similar fashion as that for Kd(490). However, radiative transfer theory tells us that the attenuation coefficient of diffuse light also varies with solar elevation, and that both Kd490 and Kd(PAR) are functions of sun angle. As a result, the current standard Kd490 and Kd(PAR) products are ambiguous, as their associated angular information is omitted. Here we present an approach that estimates such attenuation coefficients analytically, i.e. following the principle of radiative transfer. We show that the ambiguity of Kd associated with the angular information can be well corrected with such an approach.

Keywords: ocean optics, remote sensing, diffuse attenuation coefficient