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Biogeosciences Discussions

Interactive comment on "Natural variability of bio-optical properties in Case 1 waters: attenuation and reflectance within the visible and near-UV spectral domains, as observed in South Pacific and Mediterranean waters" *by* A. Morel et al.

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This very nice paper treats two important topics: (1) the variability of apparent optical properties (namely Kd and R = Eu/Ed) in Case 1 waters and (2) apparent optical properties of Case 1 waters in the UV (down to 300 nm). One of the main conclusions of the paper is (page 2156, line 27) that the utility of the Case1 designation breaks down (or at best requires different bio-optical models for different regions such as the Mediterranean or South Pacific Gyre), and that the breakdown is largest in the UV.

Others have questioned the utility of the Case 1 vs Case 2 designation, as these terms have unfortunately come to be used, and have pointed out other problems with the use of "Case 1" as a way of describing water bio-optical properties. See for example, Mobley et al., 2004, "Optical modeling of ocean water: Is the Case 1 - Case 2 Classification Still Useful?", Oceanography 17(2), 60-67. Lee and Hu, 2006. "Global distribution of Case -1 waters: An analysis from SeaWiFS measurements", Rem Sens Environ 101, 270-276, have discussed the extent to which ocean waters fit the traditional ideas of Case 1 waters. These two papers should be cited in the present one.

On page 2152, PAR(z) is computed using Ed(lambda,z). Use of Ed rather than scalar irradiance Eo will cause PAR to be undercomputed both because of the omission of upwelling light (generally a small effect of a few percent) and because of the cosine effect in using Ed (a larger effect, typically 20% to 50% error, depending on sun angle, depth, and water IOPs). I suggest that they use a notation like PARd to remind readers that PAR computed from Ed significantly underestimates the true PAR.

In the same paragraph, they use the depth at which their PAR falls to 1% of the surface value as the depth of the euphotic zone. This is a common, but incorrect, way of computing the depth of the euphotic zone. It is the number of photons that matters in photosynthesis, not the fraction than remains at depth of the photons at the surface. (The 1% light level will be the same at midnight as at noon (if the IOPs do not change) but the irradiances will be much different). The use of the 1% light level is a convenient way of characterizing a water body, but I would not associate that depth with the depth of the euphotic zone, which can be much different (depending both on incident lighting from the sky and on phytoplankton species and physiological state).

It would be nice to have a plot (or tabulated values) of their values for the absorption coef of the very clear South Pacific waters, unless this has already been presented in their 2007 Limnology and Oceanography article, which I do not have.

There are a number of missing references: Morel et al. (2006) Tyler (1966) Ryther

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(1956) page 2159, line 19: is the Morel et al. (2007) ref 2007a or 2007b? page 2163, line 28: is the Siegel et al. (2005) ref 2005a or 2005b? Siegel et al. (2002)

Interactive comment on Biogeosciences Discuss., 4, 2147, 2007.