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Biogeosciences Discussions

Interactive comment on "Yellow substance and the shades of blue in the Mediterranean Sea" *by* A. Morel and B. Gentili

Anonymous Referee #1

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Summary and general comments:

This manuscript describes an analysis of ocean color in the Mediterranean (contrasted with the eastern North Atlantic) in the context of varying contribution of yellow substances (chromophoric dissolved organic matter and particulate detritus) relative to the amount of chlorophyll. The authors use a bio-optical modeling approach contrasted with standard band-ratio remote sensing algorithms to conclude that the well-known overestimation of chlorophyll by remote sensing band-ratio algorithms in the eastern Mediterranean is due to light absorption by yellow substances that is consistently higher than the mean state (as determined by best-fit relationship to a global absorption component database). There have been similar studies carried out on global databases by Siegel, Maritorena et al. (JGR 2005, GRL 2005) that use an approach

based on inversion of radiometric spectra to retrieve similar data, and found similar results, in particular for the high latitude North Atlantic. So it was already clear that CDM causes significant overestimation of chlorophyll from ocean color on a regional basis, but this study delves a bit deeper into the particular problem of the Mediterranean using another approach.

Furthermore, the authors use the bio-optical modeling results to derive corrections for the chlorophyll overestimation via remote sensing, and present results that appear to be much closer to actual field data. This section would have clearly benefited from comparison to in situ chlorophyll data, if for no other reason but to identify what direction future algorithm improvements need to take.

One thing that really grabbed me was the distribution of Φ in the eastern North Atlantic (Fig. 2). While clearly below that of the Mediterranean in both seasons, the mean was clearly larger than 1. This suggests a bias in the "mean state" bio-optical algorithm. A global Φ product would probably be of considerable interest. I think it highlights the magnitude of the CDM problem with regard to estimating chlorophyll (and other parameters) from ocean color.

The article is clear and pretty well described. The figures are very good and need very little explanation from the text to be effective. I'm not sure the "a_{y}" abbreviation should be used in the context it is here. It has been used in the past, unfortunately, to refer to absorption by CDOM, whereas in this case it is clear that the absorption described is the sum of CDOM and particulate detritus absorption at this wavelength. I would suggest a_{cdm} as an alternative, but on the other hand this is used to denote the CDM product of the GSM algorithm – while these parameters are supposed to be the same, because of their divergent derivation they should be distinct. I don't have a solution here, but if nobody has a better idea the present usage should stand as it is, but I'm afraid it will lead to confusion later on.

Along those lines, I think it's clear that we need to have more information on the parti-

tioning of CDM into CDOM and particulate detritus absorption. As the authors observe, particulate detritus will contribute to scattering as well as absorption, and the spectral characteristics of detritus differ from CDOM (both exhibit monotonic decreases in absorption with wavelength, so inversions don't easily separate them, but detritus declines much less steeply than CDOM). Therefore the relative proportion of CDOM to detritus will have an effect on bio-optical relationships over and above the CDM absorption at a single wavelength.

Methodology:

The explanation of the derivation of a_{y} for the present paper is insufficient. This needs to be clarified. I do not know what the origin of the total absorption is. Is this in situ measurements? Inversion of reflectance spectra? I understand it's completely described in Morel and Gentili 2009 but it will be simple enough to restate it here.

Proofreading comments:

P8504, line 7: should be "modified algorithms"

p.8509 line 22: ".fr" is missing from the URL listed – also is the colon ":" correct in this URL?

p. 8511, line 5: Extra space between "Sardinia)" and "."

p. 8512, line 16: replace "prevent from getting" with

Fig.1, caption: ".fr" is missing from the first URL listed

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