Biogeosciences Discuss., 10, C3583–C3585, 2013
www.biogeosciences-discuss.net/10/C3583/2013/

Biogeosciences
Discussions
Open Access

Interactive comment on "Inversion of the volume scattering function and spectral absorption in coastal waters with biogeochemical implications" *by* X. Zhang et al.

G. Dall'Olmo (Referee)

gdal@pml.ac.uk

Received and published: 18 July 2013

General comments

This manuscript addresses a fundamental question in optical oceanography: "Which dissolved and particulate constituents determine the bulk optical properties of oceanic waters?" The approach taken by the authors is to invert scattering and absorption data collected in the Chesapeake Bay. The reliability of this approach is then assessed by inter-comparing the results of the two inversions as well as by comparing them to independently-determined HPLC-based chlorophyll concentrations and to published bio-optical relationships. The main conclusions of the paper are that 1) the method was

able to extract information on phytoplankton, even though phytoplankton contributed less than 20% of the scattering signal; 2) very small particles (VSP, < 0.2um) contributed a dominant fraction of the non-water backscattering coefficient; and 3) the inverted backscattering by VSP was correlated with the measured absorption coefficient by CDOM.

The results and conclusions presented in this manuscript have important implications for coastal ocean biogeochemistry, because they allow us to better understand which biogeochemical parameters can be monitored using optical measurements in coastal waters. In addition, this manuscript provides a potential solution to the "backscattering enigma" (Stramski et al., 2004) where observations of optical backscattering are typically underestimated by the backscattering that is modelled using as input the concentrations of particles present in the water. The authors suggest that, at least in coastal waters, a significant part of the "missing backscattering" could come from very small particles. The suggestion that oceanic backscattering is controlled by very small particles is not new. However, the novelty is that the authors report that these very small particles are in the dissolved phase (see also Stramski and Wozniak, 2005) and linked to the coloured dissolved organic matter (CDOM), which so far has been considered an insignificant source of backscattering. The manuscript is well written and within the scope of BG. I recommend its publication with minor revision.

Specific comments

Specific comments were added to the original pdf file. The most important one are:

1. An important assumption in the model used to invert the measured VSF is that scattering particles are homogeneous. I feel that this hypothesis and its implications are not appropriately described. It may be useful to at least mention that both this model and earlier predictions (Morel and Ahn, 1991; Stramski and Kiefer, 1991) rely on this hypothesis.

2. bb_{VSP} was also highly correlated with a_{NAP}. Why? It may be worth providing an interpretation for this fact.

3. A stronger validation of the results could be achieved by exploiting the HPLC accessory pigments and the relationship between S_f and the phytoplankton size distribution. Is this worth pursuing?

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/10/C3583/2013/bgd-10-C3583-2013-supplement.pdf

---

Interactive comment on Biogeosciences Discuss., 10, 9003, 2013.