**Ocean Science
Discussions**

Interactive comment on "Improvements to the PhytoDOAS method for identification of major phytoplankton groups using hyper-spectral satellite data" *by* A. Sadeghi et al.

Anonymous Referee #2

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Improvements to the PhytoDOAS method for identification of major phytoplankton groups using hyper-spectral satellite data

By Sadeghi, A., Dinter, T., Vountas, M., Taylor, B., Peeken, I., and Bracher A.

The authors present an improved version of the PhytoDOAS method to retrieve two additional PFTs. The PhytoDOAS method is based on hyperspectral data retrieved from SCIAMACHY. To overcome the correlation effects between different PFTs, the position of the peaks of the main pigments of each PFT was derived using the fourth-derivative spectroscopy. Simultaneous fit of PhytoDOAS were tested for coccolithophores, diatoms and dinoflagellates on the previously-derived optimized fit window (429-521nm).

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Interactive Discussion

Discussion Paper

Chlorophyll (Chl) results for the different PFTs were compared to chl estimated from the NASA Ocean Biochemical Model (NOBM) and PIC estimated from MODIS-Aqua.

Overall, the paper is well written, extensively describes the subject of research and clearly states its objectives. The analysis is interesting and represents an original and important contribution to the field of remote sensing of ocean colour and more specifically to the study of the distribution of phytoplankton functional types in the global ocean. The results are interesting and only minor revisions are recommended for publication of this manuscript.

General comments:

The weakest element of this paper, I believe, is the fact that the estimated data are not compared to in situ measurements. However, I believe that the authors were creative in comparing their results with independent approaches to estimate chla concentrations for 2 of the 3 PFTs they identified. Although it remains to be proven that PhytoDOAS is applicable for identification of dinoflagellates, since no comparison was shown in this paper. To further prove the correlations between the chla estimated from PhytoDOAS and other approaches, I would suggest to plot the data one method against the other rather than simply showing maps of the trends in chla.

The main goal of this paper is to prove that PhytoDOAS is a powerful tool to estimate chla for numerous PFTs at the same time. Thus, why did the authors not include cyanobacteria in their analysis, since they already proved in a previous paper that it could be identified from this approach?

Specific comments:

Is is necessary to present the full description of the approach since it has already been published in other papers?

The authors should add a table for the symbols with their units.

The level of the English in section 3 is somewhat weaker than in the other sections and

should be adjusted.

Fig. 6: I think it would be more interesting to show a map of the ratio of the chla for each PFT instead than just showing the chla concentration. It could be 2 extra panels next to the chla maps. Same apply to Fig. 7.

Fig. 8: I find that the comparison is week between the different panels by only showing the maps. To make a stronger impression, the authors should plot the values of chla from PhytoDOAS and NOBM, and PhytoDOAS and PIC data, especially since they do not show in situ measurements to compare their chla estimates. Same apply to Fig. 9 and 10.

Fig 9 and 10: Same as in Fig. 8

Technical corrections:

P3, L26: change 'as the measure of phytoplankton biomass' for 'as a proxy for phyto-plankton biomass'

P6, L2-3: Please provide the units for L and wavelength

P6, L21 and eq3: As a general rule, I always prefer when a symbol is represented by a unique letter, otherwise SC could be confused by S*C. If possible, please modify the symbol for slant column density.

P15, L20: change 'left panel' for 'top panel'

P15, L25: change 'right panel' for 'bottom panel'

P16, L13: add 'f' in 'PFT targets are itted...'

P16, L27-29: Please clarify this sentence.

P17, L14: remove 'too'

P18, L4-6: I disagree with this sentence, there is actually strong difference over wavelength below 495, especially in the zone 480-495.

P19, L19-20: Change 'while now also. . .' to 'while the North Atlantic and the North Pacific now show. . .'

P19, L21-23: Please work on these two sentences, they simply don't read well.

P19-20, first paragraph of section 3.2: Please remove this paragraph, or reduce in size since most of its information is already available in the legend of fig. 8 and 9.

P20, L13: Please remove 'As shown in Figs. 8 and 9' and add 'Fig 8 and 9 in the parenthesis of L14.

P20, L23: Remove '(upper panel in Figs. 8 and 9)' and '(lower panel)'

P20, L28: It should read (Balch et al. 2005), not Balch et al. (2005). The same apply on P21, L6.

P21, L8: Please remove 'which are shown in the' and rather put 'middle panels of Figs 8 and 9' in brackets.

P21, L19: I would add a sentence stating that the chla is much lower in NOBM than from PhytoDOAS.

P21, L21-22: Please move 'which had been achieved before in Bracher et al. (2009)' at the end of the sentence.

P21, L27-29: Please change for 'diatom chla (Fig 10, upper panel) is compared to a diatom. . .'

P21, L29: Please remove 'As shown in this figure'

P22, L2: remove 'result'

P22, L6: I believe we should read 'cannot' instead than 'can not'

P23, L11: replace 'at' by 'over' in '. . .small region at one day.'

P23, L13: replace 'the reason' by 'a reason'

P23, L14: replace 'where' by 'which' in '...where is almost blank ...'

P24, L21: should read 'global' not 'globla'

P24, L22: should read: '...for comparing with the PhytoDOAS dinoglagellates.'

P24, L25: add an 's' to 'result' in '...MODIS-Aqua PIC results...'

P26, L3: Should read 'We thank Erika Allhusen for her support...'

P27, L23: the year of reference Burrows et al. doesn't match the year on page 9

P28, L30: the year of reference Mitchell et al. doesn't match the year on page 10

P29, L21: Röttgers is not spelled like Roettgers in the text, on page 15

P29, L32: remove 'b' to the year, 2002b, same on P9

P30, L13: remove 'c' to the year, 2001c

Fig. 4: the legend states that the dinoflagellate is scaled to 0.75, whereas the caption states that it is scaled to 0.1

Fig. 8: Should read Coccolithophore (remove the 'o'). Also, I think it's confusing to write 'the northern spring', I would simply state: '...over the months of April, May and June 2005'. Same apply to Fig. 9 and 10.

Fig. 9 and 10: same as in Fig. 8 Fig 11: In middle panel, what is the meaning of the grey pixels, no chla for coccolithophores or flag pixels (cloud)? What is the scale for the 3 panels?

Interactive comment on Ocean Sci. Discuss., 8, 2271, 2011.