

Interactive comment on “Global variability of phytoplankton functional types from space: assessment via the particle size distribution” by T. S. Kostadinov et al.

Anonymous Referee #3

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General Comments

The manuscript describes applications for a method proposed by Kostadinov et al 2009 to derive independent parameters of Jung-type particle size distributions from ocean color data. The work reports spatial and time variability of the retrieved parameters, modified to represent three phytoplankton size fractions (sense Sieburth et al 1978) over the global ocean.

The retrieval of any potential biological information from remote sensing data is always relevant and important. Considering that the characterization of phytoplankton communities based on backscattering metrics are less explored (and understood) than those

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based on light absorption properties, and that a direct assessment of phytoplankton cell size is crucial for estimation of organic carbon, the subject and goals of the manuscript are relevant and within BGD's scope. The work is well written and the figures are clear and well commented. Nonetheless, there are some aspects that need revision.

Most of the introduction describes concepts and justifies the need to estimate the distribution of Phytoplankton Functional Types (PFTs) for studying biogeochemical processes. However, many publications on this subject are already published, including some revisions and comparisons among methods and approaches. The present work compared their retrieved size ranges to those obtained from HPLC pigment ratios, as a major goal.

It is unquestionable that such a comparison is important, but they are not true validations. I recommend reducing substantially the entire "validation" exercise, replacing it for a simple comparison (perhaps keep only Figures 4 and 5). The introduction can instead have a small paragraph on differences, fundamentals and assumptions of both HPLC and absorption-based approaches to retrieve cell sizes from ocean color (see works by Bricaud, Brewin, Ciotti, Devred, Hirata, Sathyendranath, Yentsch). In my opinion, the temporal analysis and the discussion of the retrieved parameters over the selected sites (having long term in situ observations) are much interesting and new, deserving emphasis.

Another very important contribution made, but unfortunately not explored too much in the results, is how complementary information to chlorophyll concentration can aid on the understanding of global biogeochemical processes. This was discussed in this paper, but a number of statistical analyses can quantify the degree to which (and where and when) particle number concentration and chlorophyll concentration do not co-vary, or how the ratio of both estimates behave in time and space. In addition, as the proposed model retrieves particle size as a continuous, the chosen size ranges can be set to smaller intervals, not being constrained to the only three classes. This may be more relevant for the nanoplankton size range than for the pico and micro, as the nano

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class is too broad (e.g., some authors suggest including an "ultra" class (2-5 μm) with nanoplankton varying from 5 to 20 μm).

Specific Comments

- use the real quantitative values instead of "satisfactory, good and poor"
- enough arguments were presented to exclude the data above 60 degrees for all time average analyses
- why was the picoplankton lower size limit set to 0.5 μm ? Sieburth et al 1978 assigned 0.2 μm .

Technical aspects

A review of nomenclature throughout the paper is needed. I acknowledge that these terms are widely used, but that does not make them correct. Here are some suggestions: - Particle size ranges (PSRs) instead of PFTs - Size ranges are only one aspect of PFT categories - inter-comparison instead of validation - Validation denotes some of the compared variables are "right" - Residuals instead of Anomalies - refers to a time series only 10 years long - Decadal average instead of climatology - same as above

- Please, review for over-citation of Kostadinov et al 2009
- chlorophyll concentration and productivity are used as synonymous in some parts of the text

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