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Interactive comment on "Remote sensing of size structure of phytoplankton communities using optical properties of the Chukchi and Bering Sea shelf region" *by* A. Fujiwara et al.

Anonymous Referee #2

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General Comments

The manuscript describes a method to estimate an index of phytoplankton cell size structure, given a set of optical properties, aiming to monitor changes in phytoplankton PFTs (or functional groups) with ocean color remote sensing data. Recently, a fair number of works have been published using different approaches and methods to retrieve information on phytoplankton, besides chlorophyll concentration, from remote sensing. These techniques and methods have a clear biogeochemical application, as does the one proposed here.

The chosen approach was to relate a size structure index (called FL), defined as the

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proportion of chlorophyll of cells larger than 5 μm and optical properties using a multiple regression empirical model. The work is interesting and all methods and instruments used are according to widely tested protocols. Thus the data set is expected to be consistent.

Either using full spectra or specify bands, the absorption coefficient of light absorption by phytoplankton is indeed related to pigment composition and packaging, and both co-vary with dominant cell size. Fewer relationships between spectral backscatter and phytoplankton cell size do exist. In the present manuscript, it is proposed to combine absorption and backscattering information into a regression model. The goal is to monitor (regionally) changes in phytoplankton dominant cell size.

As in many of the published approaches for retrieving information on phytoplankton "cells" from remote sensing, a number of approximations are necessary. Therefore, the final model tends not to be very robust, and the propagation of the different sources of errors are difficult to access. On the other hand, the proposed model is simple and easily applied to remote sensing data, Note that it is necessary to choose among semi-analytical models to derive phytoplankton light absorption coefficients from ocean color. The model is presented as chlorophyll independent and was applied in two composite remote sensing reflectance images (monthly). The results suggest that there was a significant decrease in cell size in the interest region from August 2006 to August 2007.

My major concern with the manuscript is that it does not answer its central question clearly. It is stated that the use of aph AND bb as inputs will be best than using only one or the other separately. Also, the model is not totally independent of chlorophyll. Therefore, a major revision is needed before publication.

Specific Comments

Abstract : it may be interesting to add a reference after "the northward shift of the ecosystem structure in the Chukchi Sea and Bering Sea shelf region" or refries this sentence.

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Equation (2)- I would not recommend to use this data set.

A number of previous works relating phytoplankton cell size and the backscattering coefficient need to be cited and incorporated in the discussion.

Legends of all Figures need to be more detailed.

Analyses and validations must be improved to access the central scientific question proposed.

Interactive comment on Biogeosciences Discuss., 8, 4985, 2011.

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