Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-508-RC1, 2018

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Phytoplankton size class in the East China Sea derived from MODIS satellite data" *by* Hailong Zhang et al.

Anonymous Referee #1

Received and published: 25 February 2018

The East China Sea is a marginal sea that includes a large area of shallow continental shelf. Water dynamics in the ECS is very complex due to the influence of wind, intrusion water of the Kuroshio Current, the freshwater discharge from the Changjiang (Yangtze) River, and the topography. Phytoplankton productivity and community structures show large gradients from the open ocean to the shelf and to the estuarine waters. In this study, the spectral-based model proposed by Wang et al. (2014) was modified to retrieve the phytoplankton size classes (PSCs) from the MODIS derived phytoplankton absorption spectra. This is the main novelty of this paper, which is also the important basis for studying the spatial and seasonal variability of PSCs from MODIS ocean color data. As shown by Wang et al. (2014), based on in situ measured phytoplankton absorption spectra(aph(λ)), or aph(λ) derived from in situ measured remote sensing

Printer-friendly version

Discussion paper

reflectance (Rrs) with QAA algorithm, this approach showed good performances. In this paper, uncertainty of aph spectra retrieved directly from MODIS ocean color data is key for determining the accuracy of this model. Validation of this model based on about 21 data points is encouraging, however, as shown in Fig. 7, there are still large deviations between measured and estimated value. The general spatial distribution of PSCs maybe reasonable. But for some specific areas the credibility of these results is still an open question. Discussion (4.2) about the spatial distribution and the seasonal variability of phytoplankton size classes are mostly descriptive and relatively superficial. It's a good point to pick up three specific areas to discuss the seasonal variability and its relationship with SST. More explanation and further discussion about the physical and chemical environment for these areas could be useful for readers to know the feasibility of this remote sensing model. I noticed that a paper entitled "Remote-Sensing Estimation of Phytoplankton Size Classes From GOCI Satellite Measurements in Bohai Sea and Yellow Sea" was published recently in JGR by the same group. They also showed some results about this area. However, these results seem to be a little different from each other. I recommended authors to do more work about the validation and comparison of this model.

Some specific questions or recommendations as follows: (1) In ECS, the "abundance-based" approach may not perform as well as that in open ocean. How about the general variability of PSCs(fractions) with the total Chl-a according to in situ data? Since distribution of phytoplankton biomass may help us to explain the spatial variability of PSCs, I also recommend to add the seasonal distribution of total Chl-a in Fig.8. (2) For processing MODIS data, which algorithm was used for estimating the total Chl-a? How about the validation results with in situ match-up data points? (3) About the reconstruction of Rrs at 412 and 443nm wavebands, more data from SeaBass dataset were used for developing the relationship. Does this relationship exhibit the same distribution over coastal waters and open ocean? These coefficients (K) could be shown in a Table. (4) As shown in Section 4.2, the spring bloom was found to occur frequently in the mouth area of Changjiang river and middle shelf region. How about the performance

Printer-friendly version

Discussion paper

of this “spectral-based” model for PSCs retrieval for bloom waters? Does it give better results than the others (“abundance-based” model)? Clear comparison and discussion about this point could be very helpful for supporting the credibility of this model. (5) Results shown in Fig.9 is very interesting, which have already attracted much attentions from marine ecologists. I recommend authors to do further discussion about these variabilities referring those published results. At the same time, those published results about the spatial and seasonal variations of PSCs in ECS could be used for validating the MODIS derived values. (6) Temperature itself is an important factor governing the distribution of phytoplankton, which also provides a quantitative index of the physio-chemical state of the marine environment. How about the correlation between total Chl-a (phytoplankton biomass) with SST? As shown in Table 5, these correlation between SST and size fractions may have different underlying mechanism for the 3 different subareas. Some more explanations about the hydrological backgrounds of these subareas are expected to deepen the understanding.

Some specific technical suggestions: 1. Fig.1, Mean Rrs spectra for coastal waters of ECS could be helpful for reader to know exactly the ocean color variability in ECS (which covers many water types). 2. Coefficients of K in Equation (9) could be shown in a Table. 3. Fig.8, add the spatial distribution of total Chla for 4 seasons. 4. Show locations for the three subareas in Fig.8 and introduce the box size in Data and Methods. 5. Fig.9, enlarge the y-axis of (c) and (d) for total Chl-a for clarity. 6. For results shown in Table 5, a figure showing time series of size fractions and SST may be helpful for discussing their correlations.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-508, 2018.

Printer-friendly version

Discussion paper