

Interactive comment on “Assimilating GlobColour ocean colour data into a pre-operational physical-biogeochemical model” by D. A. Ford et al.

Anonymous Referee #1

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General Comments

The paper “Assimilating GlobColour ocean colour data into a pre-operational coupled physical-biogeochemical model” by D. A. Ford, K. P. Edwards, D. Lea, R. M. Barciela, M. J. Martin and J. Demaria deals with the data assimilation of chlorophyll a concentrations derived from the Globcolour project into a global ocean physical-biogeochemical model at 1° resolution during the year 2008.

In general, the paper is very well written. The manuscript represents a substantial contribution and a novel tool in the sense that it presents an integrative system including a large number of tools: the coupled physical-biogeochemical model already assimilates

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physical satellite-derived data, the Globcolour data is itself a result of merging data from three different sensors, the data assimilation method is a multivariate optimal interpolation, and a few independent in situ validation data sets are compared to the obtained results. The two objectives of the papers are to test the “operational” characteristics of the assimilation and to assess the impact of the data assimilation on the biogeochemical variables. The first objective is not really treated, but to my opinion, this is not a problem in a scientific paper. The second objective is comprehensively tackled, with scientific methods and assumptions valid and clearly outlined.

In some way, this paper looks like an oceanographic version of “too big to fail” in the sense that technical choices have been previously defined. For instance, it is acknowledged (P715,L15) that the data assimilation of physical quantities creates spurious effects on the nitrate concentration and hence on the phytoplankton concentrations in the model, which is in addition presented as a well-known effect. Nevertheless, the choice has been to keep the physical data assimilation even though the results are better without data assimilation (mentioned P705 L 22).

Given this constraint of the project, the paper is very interesting in the sense that it shows clearly the impact of a daily multivariate assimilation of ocean colour chl_a data in a CPBM. The positive impact on the 1 day forecast of chl_a is a substantial conclusion reached, with results sufficient to support it. The fact that the other biogeochemical properties are not degraded is another major result, since this multivariate data assimilation was not performed in other studies. This is also comprehensively assessed. Mentioning an improvement is a bit optimistic. For instance, a shift from a negative correlation (-0.25) to a positive correlation (+0.11) in terms of zooplankton relatively to a climatology in a few locations is certainly a good step forward, but it is not yet fully satisfactory. Probably more data would be necessary to conclude more firmly on this point, although it is acknowledged that it is probably not currently available. Also, “no degradation” is a better description of Fig. 9 than “improvement”.

It should be stated more clearly and firmly in this paper that putting together all the

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state-of-the-art elements to assimilate Chla in a coupled model allows a better estimation in terms of the chla estimated by the model (compared to the control simulation), but that is has almost no positive impact on the other variables (but also no negative impact). It is important to mention that improving Chla fields does not necessarily improve other variables fields, at the moment.

I totally agree that looking at the simulation without physical data assimilation is out of the scope of the present study. But the authors have elements to conclude whether the data assimilation of physical data degrades so much the impact of the data assimilation of chla data that finally the two approaches are incompatible. Mentioning this incompatibility in the combination of these two tools could be a progress for future studies. This point could be adressed further in the paper, since it looks like the authors have enough elements to give a substantial contribution on it, given their experiments.

Specific comments

P705, L15:In the North of Brazil, it could be possible that the lack of Chla in this place is due to an underestimation of the nutrient input by the Amazon River?

P706, L20:It is positively appreciated that the errors are explicitly expressed in $\log_{10}(\text{mgm}^{-3})$ troughout the manuscript.

Technical corrections

Possibly, drawing the Figs. 7 and 10 in a square form would be more clear relatively to the fact that the 1:1 line is the perfect match.

Interactive comment on Ocean Sci. Discuss., 9, 687, 2012.