Interactive comment on "Assessing the role and consistency of satellite observation products in global physical-biogeochemical ocean reanalysis" by David Ford

Anonymous Referee #2

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First, I apologize for being so late with the review, due to exceptional circumstances.

The paper aims at assessing the impact of 4 remotely-sensed datasets on different versions of a global model, and in particular examine the consistency in between the datasets. The impact of assimilating one or multiple datasets into the models is examined in terms of different model variables. The datasets covers physics and biology, and the impact of physics on biology is also examined. The inverse is not examined, as there is no feedback from biology to physics. Some interesting -and sometimes maybe counter-intuitive- conclusions are obtained, e.g. that the assimilation of certain datasets degrades certain model variables.

The methods and the results are clearly described. Given that the models (physics and biogeochemical) and data assimilation methods are already extensively described and validated in previous papers, they form a very sound basis for the present study. There are some limitations or deficiencies in the modeling system, but they are known and acknowledged. Thus, it does not require to be validated again in the present paper. Some aspects of the data assimilation procedure feel a little like a cooking recipe, but I guess all modelling systems have these kind of safety nets in their implementation of the data assimilation (e.g. skip assimilation some days when it renders the model unstable, or at least play with the error covariances...).

In general, the paper is clearly structured, very well written, and I did not find typos. The paper is very interesting and timely, because it provides the kind of information needed for near-future versions of biogeochemical model simulations, both reanalysis and operational. As the author mentions, the impact of data assimilation of physics on biogeochemistry is still insufficiently studied, in particular methods for mitigating the impact of spurious vertical currents, but this point is not the topic of the present paper. This study about the remaining problems linked to co-assimilation of different variables is very welcome.

Minor remarks:

* although the author refers extensively to the relevant papers for the physical model, biogeochemical model, and data assimilation method, it could help to very briefly provide a few key facts. For example, for the physical model, he could mention the Nemo version (around line 62 page 3). For the BGC model, he could mention how many state variables there are, etc.

* the results seem valid for both the 1 degree and 1/4 degree models (independently from the fact that the higher resolution seems to present better results, even though the double penalty). But little detail is given regarding the resolution, and potentially, generalisations to even higher resolutions such as used in other regional models.

* can the author give precisions how his conclusions may ultimately lead to refinements or improvements in the models (as he says in the abstract that this is a potential benefit of the study) ? Is he thinking of methods like parameter estimations, or is he simply pointing to the known limitations of the current modelling system (such as biases mentionned at line 179, 189, 206).

* maybe the text about the safety-nets of the assimilation procedure can be re-written to make it feel more rigourous (as it certainly is)

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