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Biogeosciences Discussions

Interactive comment on "Skill assessment of the PELAGOS global ocean biogeochemistry model over the period 1980–2000" *by* M. Vichi and S. Masina

Anonymous Referee #1

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General comments:

In this paper, the authors assess the spatial and temporal variability of the PELAGOS model toward various available biophysical measurements. They applied many different evaluation techniques in order to objectively validate the model simulated variability for the last 20 years of the 20th century. They shows that PELAGOS is generally capable of simulated the spatial and interannual variability of observed chlorophyll and net primary production. And that its predicting skill it is as good as the other OBGCMs and diagnostic models based on satellite data. Overall, the model simulates well the mean variabilities of number of measurable variables but remain having troubles to get the

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correct amplitudes.

This certainly is a useful model-data assessment manuscript and could serve as a baseline for other scientists who are eager to vigorously evaluate their model performance. However, I feel that there is insufficient scientific results produced from the manuscript. I think that this manuscript is promising and can be improved from just a 'reasonable model-data fit' paper. This can be done by including more discussions on the scientific findings from the study. Therefore, I recommend not rejecting the manuscript.

Specific comments:

Sect. 2.1, P. 3516 line 9: "... one-at-a-time modification ..." I am not sure what is meant by this.

Sect. 2.2, P. 3517 line 9: Is there any specific reason of not using the most recent, possibly improved, carbon-based NPP data (Behrenfeld et al., 2005)? They are available on this website: http://orca.science.oregonstate.edu/1080.by.2160.monthly.hdf.cbpm.s.php

Sect. 3.1, P. 3520 line 17: "... the early stratification ... maximize production ..." I don't understand how shallow MLD (and not deep MLD) favours the bloom of diatom. Nutrient is generally maximum when MLD is deep. Please justify or elaborate your statement.

Sect. 3.2: Have the authors look at the regional MEF index between PELAGOS and VGPM as in Fig. 2? It would be interesting to see if the simulated NPP has similar problem in the Southern regions, especially around October.

Sect. 4.2: This study shows the fact that a portion of the modelled NPP is loss to DOC, and needs to be removed when comparing with the observation. Additionally, it also shows that the simulated variability of NPP is determined noticeably by this loss ratio (P. 3524 line 18: "This suggests..."). In my opinion, this is an important findings that

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can or should be further discussed in the manuscript, even mentioned in the abstract.

Sect. 5.1: The above parameter is also found to be deterministic in simulating the observed temporal variability (P. 3526 line 23) and that a constant value is insufficient. Is there any other studies who have similar findings (e.g. in situ studies that show this parameter varies with physical conditions)?

The PELAGOS seems capable of simulating very well the observed MLD in BATS. Nevertheless, it has trouble getting the right amplitude of chlorophyll variability. I would be interested to know how it simulates the nutrient concentration and compare it to the observation. Table 2 clearly shows that the model significantly underestimate the standard deviation of nutrients, but it is not discussed further in the paper.

Sect. 5.2: Discussion on nutrient simulation (similar as above) would be a positive addition to the paper.

Sect. 6, P 3534 line 7: "It is however clear..." The authors are trying to emphasis (using the modelled bacterial production) that extrapolation of process rate variables could result in misleading general interpretation. This statement, I thought, is one of the main scientific findings from the study.

But there is little or no discussion within the paper regarding this issue. The authors should at least introduce past problem or background in the 'Introduction' section. For example: Several studies have pointed out some evidence of biogeographycal provinces and that different ocean regions have different biogeochemical characteristics (i.e. different set of parameters) (Longhurst, 1998: Sarmiento et al., 2004; Hood et al., 2006; Tjiputra et al., 2007);

Sect. 7, P. 3535 line 6: "The bias is further..." This statement is never discussed in the paper earlier. The authors should briefly justify how the usage of adaptive chl:C ratio increase the model bias.

P. 3536 line 9: "In our specific case..." Does this mean that future measurements of

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DOC/exudation rate (especially in the oligotrophic areas) are crucial to improve current ecosystem model forecast? If yes, it may be useful to provide some recommendation, or potential strategy to address this problem.

Sect. Appendix A It would be useful for unfamiliar audience to also include the formulation of RMSDcp

Others: Is there any reasons why the authors plot both NPP1 and NPP2 in Fig. 10 but only NPP2 in Fig. 8?

Technical corrections:

P. 3512 line 4: Replace “To this...” with “For this...”

line 8: Replace “XX” with “20th”

line 24: Replace “has skill” with “is able”

P. 3514 line 11: Replace “XX” with “20th”

P. 3517 line1: Replace “...global scale, but on...” with “global scale. On the...”

P. 3518 line 1: Replace “MDS...” with “The MDS...”

P. 3519 line 2: Reformulate the sentence to: “In the center of the gyres and the coastal upwelling areas, the simulated surface values generally underestimates more than the integrated values.”

line 11: Reformulate the sentence “The North Atlantic ...”

P. 3520 line 13: describe how you define “sub-Antarctic province”

line 17-22: if possible, split into two sentences

P. 3527 line 8: Replace “recovery” with “recover”

P. 3529 line 16: Replace “understimated” with “underestimated”

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P. 3530 line 11: Reformulate the sentence, maybe into: “During El Nino events, the amount of surface chlorophyll derived from ocean color observations is reduced because upwelling is suppressed.”

P. 3532 line 23: Do the author mean “BCD/NPP” and not “BCD/CP”?

P. 3534 line 16: Replace “XX” with “20th”

P. 3535 line 9: We consider “it” unlikely...

P. 3537 line 12: Replace “-” with “+”

P. 3555: Switch Figs. 6 and 7. Fig. 7 is mentioned first in the text.

P. 3555, Fig.6: Indicate which (31 or 32) is NPP1/NPP2

P.3562: Fig 13c caption mention ‘annual mean value’ but the figure title shows period between Nov1991-Jan1992. Need to be clarified.

The overall English of the manuscript can also be further improved as well.

References:

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Sarmiento, J. L., Gruber, N., Brzezinski, M. A., and Dunne, J. P.: High-latitude controls of thermocline nutrients and low latitude biologica productivity, Nature, 427, 56-60, 2004.

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Interactive comment on Biogeosciences Discuss., 6, 3511, 2009.