Geoscientific
Model Development
Discussions

Open Access

EGU

Interactive comment on "BGC-val: a model and grid independent python toolkit to evaluate marine biogeochemical models" *by* Lee de Mora et al.

Anonymous Referee #2

Received and published: 4 July 2018

General Comments

de Mora et al., present a overview, introduction and description of the BGC-val toolkit for evaluating biogeochemical models. It includes the motivating philosophy, the structure and basic use of the toolkit demonstrated by examples. I have not personally used BGC-val before so hopefully my comments are a useful measure of the accessibility of the manuscript to the wider biogeochemical modelling community.

Overall, the toolkit itself has many useful and valuable features including the grid-independence which facilitates straightforward inter-model comparisons without the issues of re-gridding model and observation data. The use of front-loading functions and the html output make this is a very user-friendly toolkit which is also welcoming. The manuscript provides a thorough and detailed description of the toolkit that would

be a useful resource and basic guide for potential users. However, the manuscript is quite long and verbose in places and so would benefit greatly from improvements to its structure and presentation. I have provided specific comments including suggestions on making the manuscript clearer below.

Specific Comments

Abstract: It would be useful to state the intention of the manuscript upfront echoing the text on Pg 3 lines 2 - 5

Pg 2, lines 19 - 33: Much of the text here seems to repeat ideas and themes from the preceding part of the introduction which makes the Introduction as a whole difficult to follow. I would suggest the text on UKESM1 follows well from the CMIP text, and the text between be incorporated into the first few paragraphs.

Pg 2, line 20: 'sink' would be a more appropriate term rather than 'sequesterer'

Section 1.1: I appreciate the discussion in this section, as it's rare to find reflections of this kind. The section raises a number of important issues such as the scarcity and uncertainty associated with observations and the trade-off of between model complexity and computational efficiency. However I think these these require a more quantitive approach to model evaluation (e.g., Stow et al., 2009, Progress in Marine Systems; Kriest et al., 2012, Global Biogeochemical Cycles; Buchanan et al., 2018, Global Biogeochemical Cycles) that is not currently available with this toolkit. Therefore, I don't think this section fits well within the manuscript and could be removed to make a more concise manuscript and still be equally strong.

Pg 3, line 27: please briefly elaborate on the influence of biology on physical circulation

Pg 4, lines 8 - 10: export production is a pertinent example here that could be included to provide a biology-specific example e.g., Boyd Trull (2007) Progress in Oceanography; Henson et al., (2011) Geophysical Research Letters

Section 2: Concepts such as grid-cells and masking are defined here in a number of

sentences which seems unnecessary given that readers interested in a biogeochemical model evaluation toolkit are likely to know these concepts. Removing or cutting these sentences down would streamline the text and make it easier to read.

Pg. 6, line 11: this is very similar to the preceding sentences

Pg. 18 line 18: '. . .is a climatological dataset, and hence does have a time component', is a 'not' missing here?

Pg. 22 line 22: I would generally take 'point to point analysis' in a model-data comparison context to refer to the use of individual bottle measurements rather than climatological data. I'm not clear which of these this section is demonstrating. In either case, is there a procedure for when multiple observations correspond with a single model grid-box?

Pg. 32, lines 6 - 15: I think the description of results throughout highlights the use of the toolkit well but I think this text is presenting some extra results with the hypothesis which I don't think is appropriate in this type of manuscript.

Figures: There are a number of figures given as examples of BGC-val output but they are quite difficult to link to the different packages discussed. I think it would be much clearer and easier to comprehend if the figures were grouped as sub-panels in individual figures. For example, Figures 3, 4, 5 could comprise a figure demonstrating the timeseries package, Figures 6,7,8 would demonstrate the timeseries package with a depth component, Figures 9,10,11 would demonstrate figures from the point-to-point package etc. . .

Figures: What control do you have in setting figure characteristics such as the min/max of scales, and colour scale? Are there options to export the figures in different formats, e.g.. bitmap and vector formats?

Section 5: Many of the concepts such as AMOC, ACC, anthropogenic CO_2 and productivity discussed are each defined in a number of sentences. Again, it would seem

that readers would be mostly familiar with these concepts. Removing or cutting these sentences down would help streamline the section and make it easier to demonstrate the toolkit capabilities.

Conclusions: Can you expand on potential future developments or expansions? For example, could quantitative model evaluation be built into this toolkit such as Taylor diagrams and other metrics (Jolliff et al., 2009; Stow et al., 2009 in Journal of Marine Systems). Does the design of the code facilitate this?