**Geoscientific
Model Development
Discussions**

# *Interactive comment on* "Addressing the impact of environmental uncertainty in plankton model calibration with a dedicated software system: the Marine Model Optimization Testbed (MarMOT)" *by* J. C. P. Hemmings and P. G. Challenor

**Anonymous Referee #2**

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This is an interesting manuscript describing new software for model optimization and its application to a study investigating the effect of modifying the weights used in the optimized cost function. This is a well thought out study, which generates some solid and important conclusions. I have no issues with the study itself, but have some suggestions for improving its presentation in this manuscript, so that the results may be better understood by a wider audience. I recommend this manuscript for publication after the suggestions below are considered.

(1) There appear to be two separate goals of this manuscript: (i) Advertising the new

MARMOT software and (ii) examining the effect of changing the weights used in the cost function. The way the manuscript is currently written, the first goal seems to be given greater emphasis than the second. I would recommend that this be reversed: more emphasis should be placed on the specific application of the software, and less on the software itself. Some parts of the manuscript describe aspects of the software that might not be used in this particular application – that information should be contained in the appendices only.

(2) Section 3 is essentially the "Methods" section in this manuscript; however there is quite a bit of text that describes what could be done with this software and/or what others have done in past studies. The text is more difficult to read because of this jumping back and forth between relevant background (what others have done, i.e. sections 3.1 and 3.1.2) and what is done for this particular study (section 3.1.1). This "background" material is very useful and provides a very thorough literature review, but it should be in a separate section than the "methods" text. Section 3 should only describe what was done in this specific application of MARMOT.

(3) This paper would benefit from the addition of a summary/conclusions section. This material is essentially already in the "discussion" section, but I would suggest breaking it out into a separate section.

(4) One of the primary results in this manuscript seems to be that the weights traditionally used in parameter optimization studies cause overfitting, whereas the new weights suggested here do not. I would suggest that the authors give more emphasis to this interesting result. Furthermore, the discussion section should provide a more detailed explanation as to why this occurs, and should include less generic information on the benefits of the MARMOT system. Again, I feel that the details of the MARMOT software would be more appropriate for the Appendix.

(5) The abstract is generally well written, however I feel the abstract needs to be written in simpler terms, so that it will be well understood by a wider audience. When I first

skimmed the abstract, before reading the manuscript, I was confused as to what exactly the main point of this paper was going to be. Of course after reading the manuscript, the abstract seems perfectly clear, but ideally one would like readers to be able to skim the abstract and understand exactly what this study entailed before reading the paper.

I would suggest removing the last sentence of the first abstract paragraph, which describes details of MarMOT.

The key sentence in the abstract also needs to be moved up earlier in the abstract, and emphasized more: "The experimental aim is to investigate. . ." I would suggest putting the goal first, and then describing how this goal will be achieved (via MarMOT.)

In addition, the overall goal of this study needs to be made clearer in the abstract: "to investigate the effect of different misfit weighting schemes on parameter recovery in the presence of error in the plankton model's environmental input data." What type of misfit? What type of weighting schemes? What is parameter recovery? Only a specialist in this field will understand this jargon. This goal must be translated into simpler English so that even a non-specialist will understand. One of the unique aspects of this paper is that whereas numerous previous studies have looked at the effects of uncertainties in the many tunable parameters, almost no one has looked at the effects of uncertainties in the physical forcing fields that are required by these models. This is how this paper differs from other papers on this topic, and this should be emphasized in the abstract.

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