

Interactive comment on “Reviews and syntheses: Parameter identification in marine planktonic ecosystem modelling” by Markus Schartau et al.

Anonymous Referee #4

Received and published: 8 August 2016

In this manuscript the authors provide an overview of various topics of consideration for the implementation and evaluation of marine planktonic ecosystem models, focused primarily on assessment of errors and uncertainty, techniques for optimization of model parameters, and model development considerations.

The overall effect of this manuscript is a thorough discussion of the diverse approaches to parameterization, describing mainstream tactics, recent advancements, and possible new directions. Marine ecosystem model parameterization is a wide and still rapidly developing field, and this synthesis of major methodologies addresses a growing need for such resources for both veterans and those new to the field. The manuscript is well written and directly relevant to the scope of Biogeosciences, and I recommend publication with some revision.

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General Comments:

One of the main objectives of this paper is to “provide support to readers” who strive to understand the diversity of parameter estimation approaches despite the variety of terminologies and notations used. Because of the broad range of topics covered throughout even this article, I feel that including a glossary of symbols (with or without short descriptions and page references) used in all equations, perhaps as an appendix, would be a helpful guide to readers.

To make the manuscript more understandable by novices in the field, the authors may want to begin the review with Section 5 “Typical parameterisations of plankton models and their parameters” rather than starting with error models. Given that the title of this article is parameter identification in plankton modeling, it seems strange that theoretical discussion of error models comes before any discussion of actual ecosystem parameterization attempts.

The manuscript is quite long and certain sections contain significantly more detail than others. As a result, the manuscript would be improved if the sections could be made more consistent in terms of their degree of detail.

Specific Comments:

In certain places, e.g. section 2, the article assumes a familiarity of terms, which may benefit from greater introductory explanation. In particular, I found the description of “kinematic model errors” and “dynamical model errors” on page 6 somewhat lacking. If these are the terms commonly used, I would suggest including reference to a more thorough explanation, otherwise I would suggest providing a greater introductory explanation since you use these terms repeatedly. Likewise, at the beginning of section 4.1, a few introductory remarks describing the authors’ specific intended meanings of “confidence” and “credible” would be helpful when transitioning into this section.

Section 2.2 would likely benefit from being split into a few subsections.

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Should section 4.2 be in section 4? Should section 4.3 come before 4.2?

Page 26, line 2: Can you mention one or two advantages of mesocosm data to complement your mention of drawbacks in the next sentence?

Page 40, sect 8.3: Can this section include a mention of where the authors think the use of combined emulators is headed? What are the hurdles to overcome?

Page 45, line 18: After stating that an appropriate treatment of uncertainties for Earth system models is critical, it seems as if this section is going to go into depth on that subject, but it is a cursory overview. I would suggest mentioning here that a full treatment of uncertainties in Earth system models is beyond the scope of this article.

Page 48, section 10.1: It seems that this paragraph is not focused on what the section title states. Half of the paragraph is about a novel thermodynamically inspired ecosystem model. Can the title be reworded, or the text reworded as to relate more to “keeping number of free parameters low”. Also, in the title, what does “grasping” mean in reference to complexity?

Technical corrections:

Page 1, lines 9 - 16: Tense consistency: these lines begin in the present tense (e.g. “we explore how. . .”) and then use the future tense (e.g. “complexity will be covered. . .”)

Page 3, line 15 “such a marine plankton ecosystem”

Page 4, line 29: “we like to”

Page 5, line 1: no hyphen in “branch off”

Page 5, line 8: comma after “Sect. 10”

Page 7, line 25: sigma, used in eq. 5, should be defined here.

Page 8, line 32: spelling of “maximum”

Page 9, line 13: “We will see an example of this below”. Can you please indicate where

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the example is shown?

Page 11, lines 5 - 15: great discussion of terminology.

Page 12, line 21: “In many cases when sampling. . .”

Page 14, line 17-18: Can the sentence beginning with “One must only. . .” be reworded? It is unclear as it currently stands.

Page 15, line 35: Which NPZ model is this?

Page 16, line 10” “. . .since they may not be sufficient”

Page 16, line 31: Should this read “Multimodel inference would allow the grazing parameters. . .” instead of “. . .allow the P-I parameter values”?

Page 17, line 13: comma after “ML estimator”

Page 18, lines 5: I would suggest changing “can be” to “are” for consistency with the next sentence.

Page 18, line 28: “level”, not plural

Page 18, eq. 14: Is ‘T’ the truth operator from eq. 2? If not, can you state what this represents.

Page 19, line 12: “so that” should be “that”

Page 22, line 18: replace “it”

Page 23, line 10 - 19: check verb tense.

Page 23, line 11-12: Include “for example”, since alphas have been derived from many other studies as well.

Page 23, line 26: “has” instead of “had”

Page 23, line 27: When did this discussion regain importance?

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Page 25, line 23: “a” instead of “a the”

Page 26, line 23 “. . .can thus be derived. . .”

Page 28, line 25: no comma after “compensatory”

Page 29, line 3: “simulation”, not plural

Page 29, line 16: “Similarly, an [any?] extra flexibility?”

Page 30, line 15: “has” instead of “have”

Page 32, line 12: “. . .with an independent. . .”

Page 36, line 20: “. . .thousands of years. . .”

Page 37, line 8: Can this sentence be reworded or removed? It is unclear how this connects with the previous sentence.

Page 37, line 11: “to the original”

Page 37, line 17: “has” instead of “as”

Page 40, line 29-30: This is a sentence fragment.

Page 41, line 22: Is “close to the heart” appropriate?

Page 42, line 2: “. . .it remains”; no comma after “investigated”

Page 42, line 25: “.” instead of “:”

Page 43, line 6: no comma after “value”; “the” instead of “that”

Page 43, line 7: “or” instead of “and”

Page 43, line 9: “which” instead of “that”

Page 44, line 26: extra comma

Page 46, line 5: extra space after “30”

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Page 46, line 24: comma after “‘ignorance’ prior”

Page 47, line 25: are these quotes necessary around “emulator”?

Page 47, line 31: “and” instead of comma after data sets

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