

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

**Anonymous Referee #1**

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**Review comments for the manuscript: “Reviews and syntheses: Parameter identification in marine planktonic ecosystem modelling (bg-2016-242)” by Markus et al.**

General comments

The authors provide comprehensive reviews on parameter identification in marine ecosystem modeling with theoretical background, specifications of varied sources of uncertainty and examples of parameter identifications from literature. This paper also discusses the trade-offs between model simplicity and complexity coming from the number of represented processes, a number of parameters and variability of those parameters in space and time, as well as other important topics in modern ocean bio-

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geochemical research. This paper is well-written and very informative. I recommend publication with only a few minor revisions.

Specific comments

In section 2.3, the authors provide two forms of probability densities and cost functions based on the statistical properties of errors. When one consider the lognormal distribution for errors, the error covariances in (11) and (12) should represent the uncertainty in logarithm space and be different from those in (9) and (10) (e.g., Fletcher, 2010; Song et al., 2012). If I am not wrong, the optimal solution for (12) represents the mode while that for (12) without  $2\sum_{l=1}^{N_{\Theta}} \log(\Theta_l)$  represents the median in lognormal probability density function. If this is right, I think that it would be useful if you mention mode and median in the sentence after (12).

Technical corrections

- page 2, line 28: there are two “be”.
- page 3, line 22: typo for phytoplankton
- page 3, line 32: typo for assimilation
- page 8, line 32: typo for maximum
- page 13 line 2: typo for performing
- page 13 line 16: there needs space between the and “error model
- page 16 line 27: “An” alternative
- page 17 line 9: remove a space after “obtained”

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- page 17 line 9: typo for bootstrap
- page 19 line 6: first order power “expansion”
- page 23 line 22: typo for described
- page 23 line 25: typo for retrieving
- page 24 line 9: typo for usually
- page 24 line 12: typo for usually
- page 24 line 24: typo for simulated
- page 25 line 3: typo for expressed
- page 25 line 23: within “the” zooplankton
- page 26 line 11: typo for mesozooplankton
- page 26 line 23: can thus “be” derived
- page 27 line 17: typo for correspondence
- page 30 line 17: typo for simpler
- page 30 line 19: “was” supported
- page 35 line 18: “has” been explored
- page 42 line 30: typo for artifacts
- page 44 line 24: typo for additional
- page 46 line 16: typo for approach

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- page 46 line 18: typo for Bayesian
- page 48 line 11: “are” addressed
- page 50 Figure 1: The figure labels are not consistent with the description in the caption.

## References

- Fletcher, S. J., 2010. Mixed Gaussian-lognormal four-dimensional data assimilation. *Tellus A* 62, 266–287.
- Song, H., Edwards, C. A., Moore, A. M., Fiechter, J., 2012. Incremental four-dimensional variational data assimilation of positive-definite oceanic variables using a logarithm transformation. *Ocean Modell.* 54–55, 1–17.

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