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Interactive Comment

Interactive comment on "A Stochastic, Lagrangian Model of Sinking biogenic aggregates in the ocean (SLAMS 1.0): model formulation, validation and sensitivity" *by* T. Jokulsdottir and D. Archer

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The model SLAMS 1.0 is a novel and very interesting development for understanding the biological pump, particularly as it is a significant step towards a comprehensive mechanistic model. I have a few general comments/suggestions about the discussion and a few minor technical questions.

Global Syntheses of POC Flux Observations

The manuscript does not include recent publications that describe syntheses of

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large-scale and global data on sinking particles, e.g., Lam *et al.,* (2011); Henson *et al.,* (2012); Marsay *et al.*, (2015); Guidi *et al.,* (2015). Inclusion of these in the manuscript would really help highlight the utility of the model and link the manuscript to more recent work in this area. These observations have led to a number of hypotheses about the role of the reactivity of organic matter, e.g., whether organic carbon produced in blooms is more labile and therefore remineralised more rapidly in the water column (Henson *et al.,* (2012), temperature-dependent rates of biological activity (Marsay *et al.,* (2015), and particle size (Guidi *et al.,* (2015). There has also been discussion whether different key processes are operating at different depths which may or may not be coupled (Lam *et al.,* 2011). However, differentiating between these processes from observations is difficult (Lima *et al.,* 2014) and SLAMS 1.0 would seem to be a suitable tool to look at this. The results and discussion in section 4 of the manuscript are directly relevant to these findings and reference to them would help highlight the utility of the model to a wider audience. It would be interesting if the authors could briefly expand on what process(es) in the model are primarily responsible for the sensitivity of organic carbon fluxes to SSTs in the model. Additionally, a Martin Curve could be included in each panel of Figure 8 as a comparison of a common method of predicting organic carbon fluxes at depth from export production.

Application of the Model

I would be also interested in a brief additional discussion about the potential application of the model. For example, could this model be coupled to an ocean biogeochemistry/ecosystem model and if so what parameters would be needed to run the model? Which processes in the model are currently most uncertain or could be improved on, e.g., it is mentioned in the text that the model is sensitive to the ad-hoc parameter controlling ingestion by zooplankton.

Technical Comments

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It is not very clear from the manuscript how the Bloom Index is used as a parameter for the model. A brief description appears very late in the manuscript (section 4, pg.5957, lines 21:23). It could be included in the example given in section 2.2.

Table 2: There are values of 0 for BI, whilst the text states is equal to productive days/365 suggesting there is no production throughout the year?

Figure 12: The values for BI in panels b and d range from 300 to 1100, rather than from 0 to 1 as suggested in the manuscript.

Figure 8: What do the black triangle and square symbols represent?

References

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