

Interactive comment on "Variable C/P composition of organic production and its effect on ocean carbon storage in glacial-like model simulations" by Malin Odalen et al.

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In their revised manuscript, Odalen and coauthors have made a strong attempt to address the many demands of the two reviewers. The writing is much clearer so I thank them for that, and as a result the discussion of their findings is much easier to understand. Their justification for focussing on the Atlantic Ocean given more observations of benthic $\delta^{13}\text{C}$ records in this ocean basin than in the Indo-pacific is also more obvious and I find myself more convinced of this approach.

I have only a few minor, specific comments (see below). *I recommend publication of the article.*

1 Specific comments

Results

- Page 9, lines 23-30: But the C:P “observations” are not actually observations. You have applied the Galbraith & Martiny (2015) empirical model to the WOA PO_4 data. I would suggest either changing your wording from “observations”, or actually using the observations by overlaying them on the map of C:P, which are available from Martiny (2014) Scientific Data. There may in fact be a newer version. If you wish to make a comparison with the actual observations, you’ll find much greater model-data error given the high variability in these data, which is difficult to explain without invoking subseasonal variability and other environmental predictors, such as fine scale variations in light and nutrient stress that your model does not resolve. So I leave this up to you whether you wish to include and comment on. If not included, then a change in wording is necessary.

- Page 14, lines 1-6: This is a great result and the following is more comment than review. Achieving a decline in global O₂ as a result of variable stoichiometry is very interesting, as previous model studies have found it difficult to accomplish. Laurent Bopp's work, published in 2017 in Phil. Trans. Royal Society, for instance, achieved an LGM deoxygenation only by applying large amounts of freshwater to the North Atlantic. As such it can be thought of as a transient response, not a steady-state solution as you have achieved here. Again, just a comment, so feel free to include this new information or not.

2 Technical corrections

1. Page 1, line 21: missing closing parenthesis
2. Page 3, line 1: "suggest" → "suggests"
3. Page 10, line 7: do you mean WOA 2018?
4. Page 16, line 27: Should this line be a new paragraph or is it attached to the previous paragraph?
5. Page 23, line 1: "Pierce" → "Pearse"
6. Page 38, Figure 9: "origo" → "origin" ?