

Interactive comment on “Quantifying the impact of ocean acidification on our future climate” by R. J. Matear and A. Lenton

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Review of Matear and Lenton “Quantifying the impact of ocean acidification on our future climate”

The manuscript describes simulations with an Earth System Model of possible future (until year 2100) effects of changes in climate and ocean acidification (OA) on ocean biogeochemistry and climate. The main focus is to test several effects of OA on ocean biogeochemistry that have been proposed in the literature. Many of these effects remain poorly quantified. Therefore the results of this study are quite speculative. The authors conclude that the effects of OA on climate will be small but that effects on biogeochemistry (export production) can have important impacts on ocean biogeochemistry

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I think the manuscript is well suited for BG. It is well written and illustrated (although some figures are too small and the labels cannot be easily read; e.g. Figs. 5,6, 8,9). The conclusions are supported by evidence presented. Thus I recommend this paper can be published with minor revisions.

Specific comments:

The authors results are obviously dependent on the model used. E.g. the model uses a simple fixed vertical profile of POC flux and remineralization. Other models have used slightly more complex formulations for the vertical POC flux. E.g. Schmittner et al. (2008) use a fixed sinking speed and a remineralization rate that is temperature dependent. This leads to faster and shallower remineralization as the upper ocean warms. This also leads to an increased rain ratio. Schmittner et al. have speculated that this effect may counter the effect of OA on CaCO₃ production and rain ratio. A more recent paper, which should be cited, Pinsonneault et al. (2012 Biogeosciences 9, 2351pp) shows that this is indeed the case.

Due to the fixed POC flux profile used this effect is not included in the author's model but it may well play a role in more complex models and/or the real ocean. So I think it would be appropriate to discuss this.

Schmittner et al. (2008) also showed that while ocean biogeochemical changes are not important for atmospheric CO₂ and climate until 2100 they can be important on longer time scales. This may be another point the authors want to mention in this paper.

I will attach a file with other comments directly entered into the manuscript.

Andreas Schmittner

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/10/C7980/2014/bgd-10-C7980-2014-supplement.pdf>

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