

Interactive comment on “From laboratory manipulations to earth system models: predicting pelagic calcification and its consequences” by A. Ridgwell et al.

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* The Referee's main comment concerns the potential application of a hypothesized 'Eppley' curve' for calcification – see answer to overarching points (above).

* The Referee's specific comments and recommendations are addressed as follows:

1. Regarding our original focus on pH rather than other carbonate system parameters – we have now made the discussion more general and discuss carbonate saturation rather more, as suggested.
2. We are aware that Equation 1 (now 2) is a shortcut. However, writing it in terms

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of a simple reaction with carbonate ions, if that is what the Referee is suggestion, is no more 'correct'. In reality, there is continued re-equilibrium between the chemical species of the aqueous carbonate system upon precipitation of CaCO_3 . However, we are happy to clarify this in the text in some detail.

3. We have clarified the text and corrected to the term 'abiotic precipitation kinetics'.

4. We are happy to clarify the differences between the different assumed future atmospheric CO_2 changes between the various model studies and how this relates to contrasting predicted global calcification changes. The reviewer was correct to note that Ridgwell et al. [2007] stated: "the spread across the 3 different models and associated parameterizations is no more than a factor of 2 in estimating the potential enhancement of CO_2 uptake". However, this was in the context of having set the calcification sensitivity to ocean acidification to a similar value to Heinze [2004] for one comparison with the GENIE model, and a similar calcification sensitivity to Gehlen et al. [2007] in a second comparison – hence assessing differences due to the form of the parameterization only (plus other model physical and carbon cycle differences) and not the sensitivity of the calcification response itself. Without this calcification sensitivity adjustment, the spread is from less than 5.6 PgC [Gehlen et al., 2007] through 18 PgC [Ridgwell et al. [2007] to 23 PgC [Hofmann and Schellnhuber, 2009], an overall factor of ~ 4 . In fact, the estimates from both Gehlen et al. [2007] and Hofmann and Schellnhuber [2009] are for similar values of atmospheric CO_2 (~ 4 modern). Hence, a factor of 4 is arguably a truer assessment of current inter-model difference in DCO₂ estimate. We now include some discussion of this to address the Referee's point.

5. The Referee makes a good point regarding recommendations for future research – i.e., moving away from global-scale carbon cycle impacts, which have been demonstrated, regardless of the existing uncertainty, to be second order to some other feedbacks and CO_2 emissions, and towards ecosystem impacts. We are happy to highlight this in our revised manuscript.

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6. We have made the relevance of Figure 2 clearer in the text and link the pictures more closely to the discussion of differences in genotypes and the potential implications of this for understanding ocean acidification impacts. (End of Section 3)

7. [See answer to overarching points (above).]

8. The reference for 'Bissinger et al. (2008)' is, in fact, already present in the Reference list . . .

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