

Interactive comment on “Perturbation experiments to investigate the impact of ocean acidification: approaches and software tools” by J.-P. Gattuso and H. Lavigne

Anonymous Referee #2

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To some extent this is a ‘user manual’ for (‘R’) carbonate chemistry calculation software package seacarb, which is described and published elsewhere. Ideally, both might have been submitted to Geoscientific Model Development. (If the Lavigne et al. [2008] paper is not actually in a peer-reviewed journal it could yet potentially be published in GMD, which would facilitate open development evaluation and any future bug-fixing.) However, there is significant additional material in the paper that discusses the differences in carbonate chemistry manipulations and which is informative and which makes this paper useful. The following are some suggestions to aid in this.

The discussion of seacarb syntax (page 4418) and examples should be moved to an

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appendix. Currently they break up the flow of the manuscript too much. Perhaps a summary of all the syntax (e.g., meaning of all the different possible flag values could be incorporated at the same time).

The examples given at the end of each different manipulation section of which studies have used which manipulation are helpful – it would be informative to expand this to incorporate a more comprehensive listing.

I am not sure that anything is gained by plotting the initial ‘i’ and final ‘f’ chemistry states in the figures – these detailed are already included in Table 2. Figure 5 does not seem to serve any great purpose – it is just saying: halving $[Ca^{2+}]$ at constant ALK halves saturation state ... not an exactly shattering result.

I had to read the text several times before I could see why ALK is assumed constant when changing Ca^{2+} (and hence saturation state). Given that the other manipulations are by addition of something, the Ca^{2+} manipulation section (3.6) needs more careful explanation. Clearly something else (twice Na^{+} ?) must be being manipulated simultaneously in cooking up the artificial seawater to retain the same ALK. Is thus salinity not then constant? This needs more careful explanation to avoid confusion.

Table 2 is confusing and needs to be improved. Use of horizontal lines in the table to separate out the different manipulations in the table would help, as where one manipulation stops and the next starts is not obvious without careful re-reading through the text. Also separate out the ‘target’ states (Year 2007 and 2100). Adding an additional column with the relevant section number would also help.

Remind me – what is the reason (/advantage) for using the total rather than SW scale for pH ... ? It then becomes confusing when citing Lueker et al. [2000] for K_1 and K_2 , as this is basically the familiar Mehrbach et al. [1973] but converted (re-fit?) to a different pH scale?

A cautionary tale in terms of: ‘The potentially dire consequences of ocean acidification

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attract scientists and students with a limited knowledge of the carbonate chemistry and its experimental manipulation.' (the consequences of interest in the subject without the requisite underlying understanding of the marine carbonate system) can be found in Caldeira et al. [2007] (GRL 34, doi:10.1029/2006GL027288).

MINOR: Spell out the pCO₂ changes in lines 24-25, page 4414. Make explicit that amounts of CO₂ are being given as mass of CO₂ (12 + 2 × 16) rather than the much more common PgC (line 3, page 4416). (Also note that PgC is tending to succeed GtC.) Need a reference for the changes in pH between pre-industrial time and 1990s (lines 9-10, page 4416).

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