

# ***Interactive comment on* “Sensitivity of Future Ocean Acidification to Carbon Climate Feedbacks” by Richard J. Matear and Andrew Lenton**

## **Anonymous Referee #2**

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This manuscript describes how ocean acidification may be accelerated when carbon-climate feedbacks are accounted for in their model. This is a very complex and important topic which is interesting to a large scientific community. However, since the authors here take a relatively simple approach and use only one model the impact is limited. In my opinion the manuscript should be published only after some revisions, as outlined below.

Major issues: There is not sufficient discussion of the difference between the dynamics and responses of the carbon sinks between the EP and CP simulations. Nor how the sink responses in your particular model compares to those in other models. There is not sufficient discussion of the changes in ocean and land uptake in the EP simulations compared to CP simulations. Especially I would like to see more discussion about the

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overall effect these changes have on the atmospheric CO<sub>2</sub>. Again, comparison with other models would be helpful. Line 108-109: This sentence implies to me that the results are highly dependent on the land and ocean biogeochemistry in the model, and the dynamics of these sinks. The results will therefore be very model-dependent and some more discussion about how representative your particular model is, is necessary. Line 143: You use 1995 as a reference year here. Why 1995 and GLODAPv1 when there is much more recent data for 2002 and GLODAPv2? Lines 153-155: The statement here implies that the increase in atmospheric CO<sub>2</sub> concentration in the EP simulations are due to reduced land uptake. How does that fit with Figure 4? A better explanation is necessary here. Line 184: Here it is stated that the EP scenarios are more negative than the CP simulations. But on Figure 6 all numbers are positive. Rephrase. Line 160 and Figure 4: Firstly, what is the reference year here? Secondly, Is the caption for the figure correct? The label on the y-axis says PgC which suggests that this is a cumulative difference, but the caption states that this is the annual difference (in PgC yr<sup>-1</sup>). The numbers are very large given the small difference in atmospheric CO<sub>2</sub> and temperature between the EP and CP simulations. Please clarify. In my opinion this is one of the most important figures in the manuscript so a more thorough description of it and discussion of the results shown is necessary.

Minor points: The reference to Lenton et al (2015) is wrong. This is the Biogeosciences Discussions version but there is a peer-reviewed version from 2016. In the Figure 1 caption it should read “carbonate ion”. In the Figure 3 caption the year defined as present-day needs to be defined and stated. Please proof-read the entire manuscript carefully. There are many instances of misspelled words, and quite a bit of poor phrasing detracts from the reading.

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