

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

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We thank the reviewer for the constructive comments. The following are our point by point response to these comments.

1. Carbon-Climate feedbacks are one of the key uncertainties in future climate projections (the authors comment on this fact a few times across the manuscript). How does the strength of the carbon-climate feedbacks in this particular model compare with that of the other CMIP5 models? EP vs CP is a standard protocol, so data is available. To which part of the model spread do you belong to

Response: We added a more through comparison of both the CP and EP driven climate projections to the discussion (new section included). The key point is our sim-

C1

ulations fall within the range of previous projections, To show this we include recent analysis from Arora's et al 2013 ( J of Climate)

2. Not taking into account carbon-climate feedbacks in acidification projections introduces some uncertainty as was demonstrated by the authors. How does this uncertainty compare to other sources of uncertainty in projections of ocean acidification? Shall we (in extreme case) dismiss a study of e.g. Bopp et al 2013 or any concentration-forced ocean model projections which might be superior in some other aspects of parameterising ocean acidification?

R: We apologise for any lack of clarity. To put this paper in context, the study is complementary to previous published studies such as Bopp et al (2013). Here, we argue that by including carbon-climate feedbacks that the atmospheric concentration used to drive the model is higher than in the atmospheric concentration driven run. The implication of this is that the magnitude of the changes in ocean acidification would be larger (by the end of the century) and occur sooner than previously reported. The uncertainty estimated from projections using concentration driven simulations should not change significantly, rather a positive carbon-climate feedback would accelerate ocean acidification in all these simulations.

To reflect these comments, we have added these points to the discussion

1. the manuscript will benefit from more detailed review of the literature on the significance on carbon-climate feedbacks.

R: as part of revising the paper to address the general points above we have added several references on the carbon-climate feedbacks included in the C4MIP special collection (<http://journals.ametsoc.org/topic/c4mip>) such as Arora et al. 2013, and Boer and Arora 2013. We also included Jones et al. 2016 CMIP6 paper and Reichstein et al. 2013 (Nature)

l.38-42: you describe only one of the climate-carbon feedbacks but then refer to it in

C2

plural. Could you give description of other climate-carbon feedbacks? See also my previous comment.

R: Thank you we have now expanded our discussion of the potential feedbacks

I.145: actually the figure shows a systematic overestimate of carbonate ion. A more realistic assessment of model skill is needed.

R: We have now added a more rigorous assessment of model skill which includes a comparison with other published results of model projections.

Abstract and throughout the text re: More substantial significance of the carbon-climate feedbacks in lower emission scenarios. I would encourage the authors to use more careful language and to alert the reader that this relates to the relative impact rather than absolute impact. I am afraid this message might be taken out of the context and subsequently misinterpreted.

R: We agree with the statement and we have tried to be more careful in discussing the relative and absolute changes. We agree, the high emission scenario produces dramatic OA changes.

Abstract and rest of paper

R: we have carefully proof read and edited the paper to reduce the occurrence of poor grammar.

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