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Biogeosciences Discussions

Interactive comment on "Impact of rapid sea-ice reduction in the Arctic Ocean on the rate of ocean acidification" *by* A. Yamamoto et al.

Anonymous Referee #2

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How the Arctic Ocean will respond to a changing climate is remain a key open question, as does how what will the impact of these changes on the marine ecosystem. Yamamoto et al show that new projections using the Japanese Earth System Model (MIROC) show that the observed changes in sea-ice concentration are better captured in this set of IPCC AR5 simulations and more in line with published results of Wand and Overland (2009) based on IPCC AR4 model runs. Laudably it is evident that a great deal of effort and improvement has gone into the modeling effort and that the authors spend quite a large of paper detailing the differences and improvement in the model. An attempt is also made assess these simulations against the limited observations that are present in this region

In this paper they demonstrate that the implications of the earlier loss of Arctic sea-

ice, than previously projected, does impacts the rate of ocean acidification. This suggests that the rate at which ocean acidification increases will occur at much lower atmospheric concentration that previously project by model in IPCC AR4 models. The mechanisms driving this increase the rates of ocean acidification that have been previously published remain unchanged e.g. Steinacher et al (2009). While this is an interesting and valuable results that warrants publication I do still have some concerns about this paper. These concerns related to the response at the seasonal scale where the results of this paper are completely different to the aforementioned paper. This result, if correct is very interesting, however the authors devote only two paragraphs this and do not discuss these differences. I struggle also to understand the response that solubility alone in a high-latitude region can drive 180-degree phase shift in the period 2090-2099 relative to 1990-1999 or provide adequate seasonal variance. The transition period of little variance in the seasonal cycle also interesting although not explained.

It is well demonstrated that this model is a welcome advance forward in terms of IPCC however it might be equally interesting if the authors contrast the results of different RCPs e.g. RCP 4.5 vs 8.5 While is true that at the RCPs in the coming decades are similar this is also a result and has important implications for the transition response discussed in Cai et al (2010; Science)

In terms of presentation the paper is difficult to read in sections due primarily to verb placement and lack of punctuation, while many are listed below this is not exhaustive. In general I would suggest to authors to use shorter sentences and paragraphs to streamline the intended message.

Major comments: The breakdown of drivers in the discussion of the changes in omega is poorly explained and hard to follow; it needs more explanation

Section 4.3 is inadequate and I remain whole unconvinced of the results in section (discussed above).

BGD

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Minor Comments: There numerous typogographical errors that needs to be addressed

References:

Steinacher, M., Joos, F., Frölicher, T. L., Plattner, G.-K., and Doney, S. C.: Imminent ocean acidification in the Arctic projected with the NCAR global coupled carbon cycle-climate model, Biogeosciences, 6, 515-533, doi:10.5194/bg-6-515-2009 (2009).

Wei-Jun, C. et al. Science doi:10.1126/science.1189338 (2010).

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