

Interactive
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Interactive comment on “Seasonality of sea ice controls interannual variability of summertime Ω_A at the ice shelf in the Eastern Weddell Sea – an ocean acidification sensitivity study” by A. Weeber et al.

Anonymous Referee #1

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The submitted manuscript deals with variability in the saturation state of aragonite ($\hat{\Omega}_A$) in an Antarctic shelf region. The drivers of summertime $\hat{\Omega}_A$ are physics and biology, with the latter being driven by physics through the timing of the melting of sea-ice and hence light availability. Also nutrient availability and supply play key roles (incl. Fe). Observations of carbonate chemistry variability have been made by other authors for both Arctic and Antarctic regions. The quality of the data is fine, with a somewhat high value for the precision of the DIC measurements. It is unclear whether nutrient concentrations were taken into account for the TA calculation.

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Overall, the work is interesting but the draft of the manuscript should have gone through quite a couple of more cycles of internal reviews by the authors. There are many spelling errors, repeats and a weak structure. It is very hard to follow the storyline in the paper, as issues are repeated and key processes are not very clearly presented. The manuscript is too long. The paper lacks from a clear statistical approach in the data interpretation. Are there significant relationships between the observed variables?

The shelf region of the Antarctic continent is an important region for study of variations in carbonate chemistry under climate change conditions. The topic of the manuscript is important. The contribution by this paper, in its current form, is however insufficiently strong to make a good impact.

P 1654 Abstract. The abstract is very hard to read, with poor sentence phrasing and lack of quantification. The reasoning is hard to follow. Line 2: its???? What is its? line 4/5: seasonal cycle of what? Variability of what? Which ecosystem? In case seasonal cycles are unclear, then this study will not address this through summer sampling. Line 7: drivers of what? Seasonal cycle of what? How can a seasonal cycle play a role in saturation state variability: cycle of what? Line 8: what is seasonal phasing? Line 10: how can a summer be optimal Line 12: what actually was the value of the saturation state Line 15: what impact on the mixed layer? Line 23: why would primary production decrease in future P 1655 Line 12: I am not sure what is depicted as the Revelle Factor. The definition here is unconventional. Line 13: what does sensitive mean here? Line 1 and 15: is meant here: atmospheric anthropogenic CO₂? Line 18: undersaturation also results in corrosion of shells. Line 23: there is also plenty of literature that indicates no effects of high CO₂ on calcification processes, or even enhanced calcification! P 1656 Line 17: PAR should be light availability P 1657. GPS: spell out Section 2.1: this is confusing. Read again carefully and explain carefully what was measured where, and using which instruments. Line 20: confusing to have this statement here in technique section. P 1658. Line 6. What is a 50% HgCl solution? 50% of what? Line 9: what CRM was analysed? Were nutrients analysed for the TA

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calculation? Line 13: should be: van Heuven How was chl a analysed? P 1659: sea ice concentration. This is an awkward phrase. Fig. 1: the cruise was actually between the S Sandwich Islands and the continent. It is not clear from the text where samples were collected over the years, on what cruises, at what depth and with what approaches. Fig is difficult to read, with black dots on grey background and overlapping coloured dots. Fig. 2: I am not sure what fig. 2a shows. It seems to be T, but the caption mentions omega? What are the black numbers? Fig. 3. The Lee TA calculation has its limitation, which has been shown in a number of publications. I am not sure whether Fig 3 adds anything to the message of the manuscript. P 1661: Line 12-13: why? Many calcifiers appear to grow happy under low saturation states. P 1662: line 10. The paper has many CTD sections. Why are these not used? P 1664. Start of section 3 contains many repeats of previous statements p 1665. Line 6. Is there data on nutrient supply? P 1667, line 13: is there sea ice cover or not for the bloom to proceed. This is unclear. P 1669, line 5. It is better to use the recent IPCC projections for CO₂. Line 20. I am not sure what is meant by: 'they increased. . . .' Was this a model or observational study. How was SS and ST increased. Unclear. P 1670 Line 3 It is not clear to me how the authors' model operates.

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