

Interactive comment on “Carbonate saturation state of surface waters in the Ross Sea and Southern Ocean: controls and implications for the onset of aragonite undersaturation” by H. B. DeJong et al.

H. B. DeJong et al.

hdejong@stanford.edu

Received and published: 15 October 2015

Thank you for your constructive, thoughtful feedback. We switched Fig. 1 and Fig. 2 since we now refer to the initial Fig. 2 first. In addition, we modified Fig. 4-6. Rather than defining the fronts on SST, we now use the mean front positions from Sokolov and Rintoul (2009) as they intersect our cruise track. Finally, Fig. 7 now only includes parts (a) and (c). Parts (b) and (d) are now appendix figures A1 and A2.

The track-change document is attached as a supplement. We refer to the page and

C6577

line numbers for the track-change document.

General comments Comment: The manuscript presents a large dataset of surface total alkalinity from the Ross Sea and the Southern Ocean, which together with measured pCO₂ is used to calculate the saturation state of aragonite (Ar) in the surface waters. The low amount of data available in the region, together with the importance of the southern oceans in the climate system, and the sensitivity of the region, makes this an important contribution to the field. The manuscript is generally very well written, with good and clear figures, and the data have been calibrated and cross-checked very thoroughly, which all is well described (except some missing data references mentioned below). I recommend that the manuscript is published after minor revisions, following comments below.

My main concern is the lack of a concluding section in the end. While the second last sentence starts “In conclusion...” this only refers to the most correct Ar in the Ross Sea, but any overall concluding remarks are missing.

Response: We have now added a conclusion section

Comment: The method section does not mention (as far as I can see) anything about the temperature and salinity measurements. Instead the TSG data, from historical pCO₂ measurements, are mentioned on page 8444. I would like to see more details on the T/S data utilised in the whole study in the methods.

Response: We have now described the temperature and salinity measurements (P6 L24-26; P7 L2-6)

Comment: I also cannot find any information of the POC data used? This has to be added to the method, or the very least add some reference when they are mentioned (e.g., P8441, L2, and Figure 4).

Response: We have now described the POC measurements (P6 L15-20)

Specific comments Comment: P 8435, L 7: It would have been interesting to see more

C6578

results from the discrete data. If this is planned a note about this would be in place.

Response: The discrete data will be presented/further analyzed in upcoming papers. This has now been mentioned (P7 L6-8)

Comment: P 8438, L 15-16: The definition of a western and a central region should be marked in Fig.1, if important. On the other hand this is not really discussed further and would then be better to remove.

Response: We have now removed our definition of the western and central regions.

Comment: P 8439, L 14-15: Here it would be good to refer to Eq. 2.

Response: Done (P11 L4)

Comment: P 8441, L 7-9: It would be helpful to here refer to Fig. 6; this is now done first on line 19.

Response: Done (P12 L26)

Comment: P 8440-8442: When reading the descriptions and explanations of the changes of pCO₂ (end P8440), and then the same for changes in sDIC (start P8442) I get the feeling of a repeat. Although referring to different data the explanations are more or less the same (if I didn't misunderstand). Possibly then these results can be presented together, describing a feature seen for the different regions. At least they could be referred to each other; as of now both sections find a likely explanation of photosynthesis, without any reference to the other data/results.

Response: We have added more transitions between paragraphs and have made wording changes to make our organization clearer (P12-14). We now reference back to pCO₂ when describing changing DIC_{calc} (P13 L19-20)

References: Sokolov, S. and Rintoul, S. R.: Circumpolar structure and distribution of the antarctic 16 circumpolar current fronts: 1. Mean circumpolar paths, *J. Geophys. Res. Ocean.*, 114, 1–19, 17 doi:10.1029/2008JC005108, 2009.

C6579

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/12/C6577/2015/bgd-12-C6577-2015-supplement.pdf>

Interactive comment on Biogeosciences Discuss., 12, 8429, 2015.

C6580