

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.

Anonymous Referee #1

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This is an impressive dataset and vastly increases the amount of surface carbon data for this undersampled region. The data is of very high quality and has been thoroughly cross checked with other datasets and between carbonate analyses. The authors are very honest about the offsets between the different analyses, with the CRMs and the calculated carbonate parameter values and are impressively close and for that the authors and those that undertook the analyses should be applauded. The paper is well written and succinct. However, a few minor changes would improve the papers readability and flow and it would be nice to have some discussion about the potential

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broader implications of the work – especially the future predictions.

Section 2: Study area - It would be good to have a bit more information on both the Ross Sea oceanography and the Southern Ocean. Over the last decade multiple jets have been recognised for each of the Subantarctic and Polar fronts – which one have you defined here? Can you see evidence for these different jets in your data? The SO fronts are now more commonly defined by their Sea Surface Heights (SSH – Sokolov and Rintoul 2009) rather than gradients in SST. How do you're the SAF and PF defined in the paper compare to the SSH changes at the same time? I appreciate that the SSH cannot be determined from the underway data and need satellite data to define. This would help others to compare these datasets with hydrographic data. At the bottom of page 8442 the definition of the subtropical waters is incorrect. Subtropical waters are found north of the Subtropical front rather than north of the Subantarctic Front. The waters north of the SAF are the subantarctic surface waters (SAW or SASW). I also felt that the first two paragraphs at the start of the results and discussion should be in this section as this is background information on the Ross Sea – this would help to provide more info on the Ross Sea. There is mention of west and central Ross Sea at the start of the results and discussion – but then this is not used later in the results and discussion? It would also be good to have a link between the Southern ocean section and the Ross Sea to show the association between the two areas. At the moment they read as if they are two completely separate entities with no connection.

There are several previous datasets that are not mentioned – which surprised me when there are so few datasets in this region. The Sandrini et al., 2007 and Rivaro et al., 2014 data from the western Ross Sea are not mentioned. Also it would be good to also reference the paper that was recently published by Kapsenberg et al., 2015 – from the Hoffman voyage – whose voyage report is referenced in the paper.

Where is the sub-surface data that is mentioned that was collected at 85 stations in the Ross Sea? None of this data is shown in the paper – so why is this mentioned? I assume it will be used in another paper.

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Personally I would have preferred a separation of the results and the discussion. But this is not critical. As the paper is fairly short it would have been nice to see more discussion and comparison with other regions of the Antarctic such as the Weddell Sea and the Mertz region. There are a couple of brief comments on the Arctic. How does the Ross Sea conditions and future scenarios compare with what is expected for other regions? There are a couple of paragraphs in the introduction about the implication of aragonite undersaturation on biology – but this is not revisited in the discussion. Introductions should introduce what is then discussed later... so I was waiting for some comment at the end of the paper about the fact that you suggest that the region will not become undersaturated until 2070 at the earliest.

The figures are generally very clear – except Figure 7 – there is too much data and the figures are too small to see the data. It would help if each of the maps and graphs were bigger for Figure 7. This may be just the way that it has been published on line in BGD and might be larger in the final paper. Figure 2 – I assume there is missing alkalinity data from a section of the voyage and that is why there is a gap in Figure 2f...

More minor typos and comments on the manuscript.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/12/C3652/2015/bgd-12-C3652-2015-supplement.pdf>

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