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# ***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 #2**

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General comments

The manuscript presents a large dataset of surface total alkalinity from the Ross Sea and the Southern Ocean, which together with measured pCO<sub>2</sub> is used to calculate the saturation state of aragonite ( $\Omega_{Ar}$ ) 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

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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  $\Omega_{Ar}$  in the Ross Sea, but any overall concluding remarks are missing.

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 pCO<sub>2</sub> 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.

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).

#### Specific comments

P 8435, L 7: It would have been interesting to see more results from the discrete data. If this is planned a note about this would be in place.

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.

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

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

P 8440-8442: When reading the descriptions and explanations of the changes of pCO<sub>2</sub> (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,

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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.

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**BGD**

12, C4199–C4201, 2015

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