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Interactive comment on "Neural network-based estimates of Southern Ocean net community production from in-situ O_2/Ar and satellite observation: a methodological study" *by* C.-H. Chang et al.

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Reviewer Rik Wanninkhof, NOAA/AOML

Review: Neural network-based estimates of Southern Ocean net community production from in-situ O2/Ar and satellite observation: a methodological study By C.-H. Chang, N. C. Johnson, N. Cassar

Chang and co-authors estimate a critical biological oceanographic parameter, net community production (NCP), from a compilation of oxygen argon ratios (O2/Ar) and ex-

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trapolation over the Southern Ocean domain using a neural network technique. They do a good job explaining the technique. They provide a comprehensive error analysis and do a nice comparison of other estimates on basin to local scales. The paper is well-written with good grammar and syntax. There are no major issues and the manuscript can be accepted after consideration of the following minor comments.

General: -Describe briefly how POC fields are determined. My impression is that the [remote sensing] techniques to do so are fairly rudimentary and subject to large uncertainty. -Since the estimates are for time scales on the order of a month the magnitudes could be expressed as mol/m2/mo rather than mmol/m2/day. However, daily values are often presented and it would require quite a bit of editing so probably not worth it. -It is not always clear if the entire SO is discussed (> 30 S) or only the southern part (> 50 S) (see some examples below). - As stated, the mixed layer depth is a critical parameter. A few words on differences between the ARGO derived depths and model derived depths (used) might be appropriate as many models reproduce the MLD rather poorly. - There should be mention that some of the predictor variables (e.g. Sea surface height, SSH) are smoothed due to 10(?) day repeat orbit.

Specific comments: Page 16937 line 19: "In addition, because the biological pump is the main mechanism that drives atmospheric CO2 into the ocean". As I recall the solubility and biological pumps are about equal in magnitude on large scale. Page 16937 line 25: Why is only the region south of 50 S discussed here? Page 16942 line 15: The sea-air flux is much smaller than the NCP again refuting the suggestion that the biological pump is the main mechanism of CO2 uptake. Page 16943 line 1: Sign convention, commonly fluxes into the ocean are listed as negative "-" Page 16943 section 5: It would improve readability if discussion and conclusions were clearly separated. They are intermingled. All tables: it is unclear why the 95 % CI is asymmetric around the mean (?) in this study Table 2. Again unclear why only >50 S is used. Figure 1b. I would cut off the distribution at 250 mmol to better distinguish the distribution of the majority of the data . Also convert mmol O2 to mmol C as that is used throughout .

Figure 2C. It seems odd not the specify element/compound for chl that is presented in a weight unit (mg/m3) while you do specify element/compound for molar units (molC/m3) Figure 5. Either mention in caption that scale of panel B is 10-fold that of panel A or put on same scale Figure 6 B axis label is PgC/a while text is PgC/yr

I did not peruse the supplemental material nor did I closely check references. The references do appear comprehensive and up-to-date.

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