

## ***Interactive comment on “High-resolution distributions of O<sub>2</sub>/Ar on the northern slope of the South China Sea and estimates of net community production” by Chuan Qin et al.***

### **Anonymous Referee #2**

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#### General comments

In their manuscript “High-resolution distributions of O<sub>2</sub>/Ar on the northern slope of the South China Sea and estimates of net community production”, the authors report continuous net community production (NCP) estimates in the mixed layer of the northern South China Sea (SCS). The study makes a clear contribution to understanding of productivity in marginal seas like the SCS, where prior NCP estimates are limited. To a lesser extent, the study also advances a relatively novel method to estimating NCP through continuous observations of  $\Delta\text{O}_2/\text{Ar}$ . My major critique is that the authors do not connect back to these original objectives in their paper. What new information have

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they gathered about the SCS as a result of this continuous method of measuring NCP, and how does this relate to past measurements of NCP in this region? Which methodological and/or environmental factors cause their estimates to compare or differ from past estimates? It is clear why their study is significant, but explicitly tying the discussion of results to these objectives will strengthen the scientific contributions of this paper.

### Specific comments

In the title: It is more accurate to write  $\Delta\text{O}_2/\text{Ar}$  rather than  $\text{O}_2/\text{Ar}$ ?

Line 35: Clarify what “indicator” means in this context, and in which conditions this assumption holds true (e.g., NCP may be partitioned into DOC production, particle export, zooplankton grazing, etc.).

Line 55: The water classifications are a bit confusing here. Perhaps it would be clearer to say that SCS water is a mix between two end-members: freshwater runoff from rivers and North Pacific offshore water.

Lines 70-84: It is unclear what the aim of listing these numbers is? Do the authors wish to convey that NCP is variable across SCS studies? It would be useful to reference these numbers again in the discussion for comparison. In any case, when reporting NCP and export, use both  $\text{O}_2$  and C units so that the numbers are comparable. The authors can perhaps apply the photosynthetic quotient used in the method to do this conversion to keep units consistent (line 174).

Line 79: Should the units here be  $\text{s}^{-1}$  rather than  $\text{a}^{-1}$ ?

Lines 85-86: Describe the potential inaccuracies of each discrete method so that it is clearer how this study benefits scientific understanding of the SCS.

Section 2.2: Explain how the 5-minute NCP values are scaled up to daily estimates.

Lines 179-183: As written, these two sentences imply that the authors do not know

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whether their NCP estimates represent daily or monthly signals. If they represent the latter, would this not defeat the purpose of the study, which is to resolve “highly dynamic environmental fluctuations of coastal systems” (line 87) in shorter than monthly time scales?

Lines 412-416: Clarify how the DIN and NCP criteria were chosen for each cruise. Fig. 10b is not very compelling as the lowest MLD - highest volumetric NCP data point seems to drive the negative correlation. Thus, the authors should consider removing their analysis of June 2015 data from Fig. 10b, and just discuss the analysis in the text in relation to the much stronger relationship between MLD and volumetric NCP during October 2014. Another related analysis that may be interesting is comparing NCP values at stations where MLD is deeper than the euphotic zone depth, to NCP at stations where the MLD is shallower than the euphotic zone depth.

#### Technical comments

Figure 1: Explain what the dots/markers in the panels represent. Are they the locations of the CTD casts? If not, it is worth adding the locations of the CTD casts to this figure so that readers may better understand the interpolation of MLD between casts for underway data.

Figure 3: Why were there more variables in the June cruise? This is not clear in the methods.

Figure 5: Write in the salinity units. It is worth clarifying somewhere in the figure text, as well as the main text referencing Fig. 5, that the temperature fluctuations shown here are too small to reflect upwelling.

Figure 6: Write in the salinity units.

Figure 8: Write in the salinity units.

Figure 9: Write in the salinity units.

Figure S1: This actually is referenced after Fig. S2 so consider switching the figure order. Why is [NO<sub>3</sub>-] omitted here?

Figures S3-S7: These are not referenced in the text, but they should be if they are to be published. Otherwise, it is not clear what the significance of showing these data are, as they could just go on an online repository which gets referenced in the text.

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