

## O<sub>2</sub>-based NCP estimates from underway and Bio-Argo float data

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Net community production (NCP) estimates based on autonomous O<sub>2</sub> measurements are becoming a routine technique. Here we illustrate with data from the Antarctic continental shelf how the interpretation of underway O<sub>2</sub> ( $\Delta\text{O}_2/\text{Ar}$ ) observations can be validated by simultaneous N<sub>2</sub> and  $p\text{CO}_2$  measurements [1]. Moreover, we demonstrate that Bio-Argo float O<sub>2</sub> data can be used to derive a reliable NCP estimate in the open ocean Atlantic subtropical gyres [2].

Surface underway O<sub>2</sub> measurements are often used to derive mixed layer NCP by a mixed layer mass balance approach. This depends strongly on the parameterization of air-sea gas exchange. By concurrent observation of inert gases (e.g., N<sub>2</sub>, Ar), the air sea flux parameterization can be validated at in-situ conditions. Moreover, our O<sub>2</sub>-based NCP estimate was corrected for vertical biogenic entrainment fluxes using a simple box model. Results for O<sub>2</sub>-based and DIC drawdown-based NCP agree well and regional patterns of high NCP match low  $p\text{CO}_2$  regions. The derived CO<sub>2</sub> fluxes are more ingassing than the climatological CO<sub>2</sub> flux.

In contrast to surface measurements, O<sub>2</sub> profiles can yield both surface and sub-surface productivity. However, O<sub>2</sub> profiles have only been used for NCP estimates near time series sites or extensive ship surveys. Here we demonstrate that recent advances in optode characterization and quality control measures make a water column productivity estimate away from regular in-situ referencing possible. Careful analysis of Bio-Argo O<sub>2</sub> data provides a reasonable lower bound on NCP in the North and South Atlantic subtropical gyre.

[1] Tortell, P. D., Bittig, H. C., Körtzinger, A., Hoppema, M., and Jones, E. M. (2015) Biological and physical controls on N<sub>2</sub>, O<sub>2</sub> and CO<sub>2</sub> distributions in contrasting Southern Ocean surface waters. *Global Biogeochem. Cycles*, in press, doi:10.1002/2014GB004975. [2] Bittig, H. C., Körtzinger, A., and Claustre, H. (2015), O<sub>2</sub>-based NCP in the open ocean Atlantic subtropical gyres from Bio-Argo floats. in prep.