Reviewer 1, Giorgio Dall'Olmo

Below the review is reproduced in black font and our responses interspersed in blue.

General comments

This manuscript investigates the extent to which diel cycles of oxygen concentrations measured by profiling floats can be used to estimate net community production. To this aim, techniques are presented to estimate and correct for the relatively slow time response of oxygen optodes and to discriminate physical and biological drivers of diurnal oxygen variability, in an oligotrophic but physically-dynamic region of the ocean.

In the first part of the manuscript, the authors describe the mathematical background for the correction, but most importantly they demonstrate how the time response of the optode can be estimated from successive in-situ up- and down-cast profiles. An analysis then is used to estimate how the uncertainty in the time response and random errors in the measurements impact upon the accuracy of correction. They conclude that the impact of the correction for the time response is greatest near gradients in oxygen, that the correction is able to restore the oxygen profile to its true value, and that random noise in the measurements can be amplified three-fold by the correction. They also recommend transmitting time stamps and conducting occasional up- and down-cast profiles to determine the time response of the optodes.

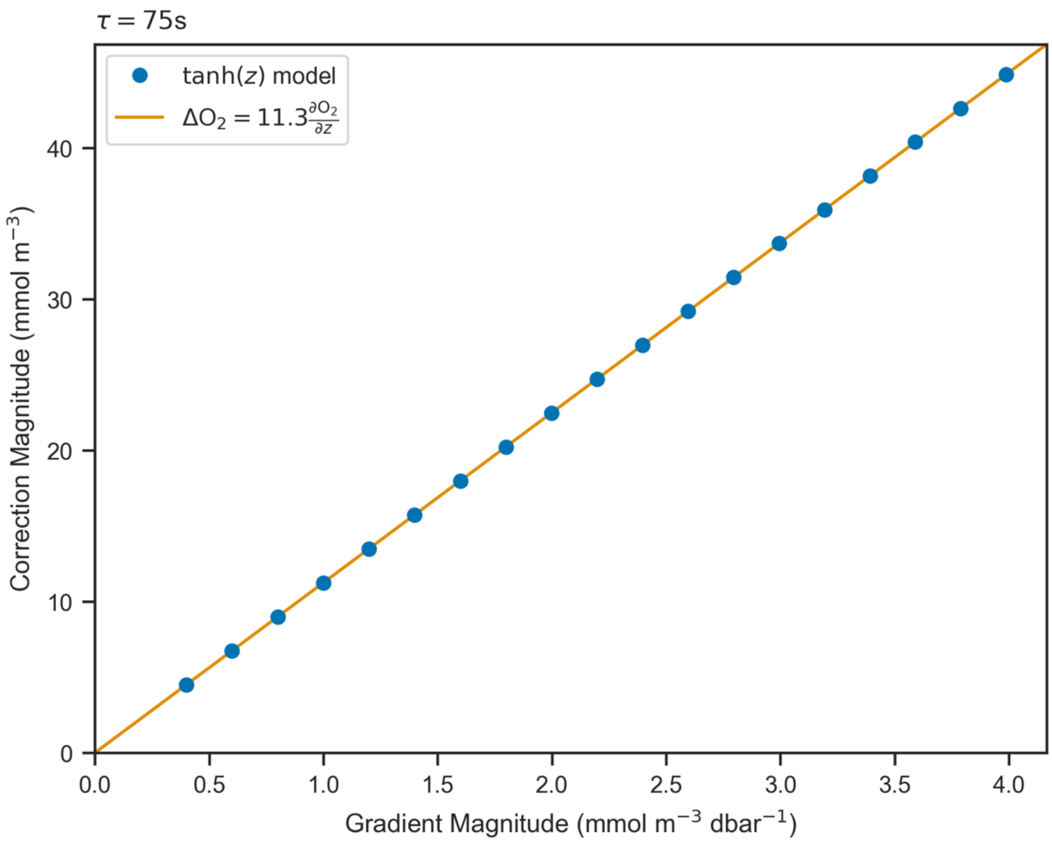
I found this first part of the manuscript very well written (as the rest of the it) and potentially very useful. I have just a few suggestions that might improve this work. 1) It would be useful to present (or anticipate) at the start of the manuscript an estimate of how large the uncertainties due the time response of optodes can be. This would allow the reader to immediately understand that this can be a first order problem that needs to be tackled. 2) I found it a little disappointing that the correction was applied based on pressure, rather than on density. How would the uncertainties reported change if the correction was applied to profiles as a function of density? 3) Finally, it would be extremely useful if the authors presented some kind of function that could be used to predict the magnitude of the correction based on the oxygen gradient (assuming a given time response). A typical value for the correction of 36-39 mmol/m-3 around the maximum gradient observed (2.55 mmol/m-3/dbar) was reported, but having a function would be even more helpful. This function could be used to derive oxygen uncertainties around oxyclines for profiles that are not corrected for the time response, which is important to better understand the data. Of course, this additional analysis is not mandatory, but could definitely expand the impact of this paper.

Response: Thank you, we appreciate the positive and constructive comments. Regarding the specific suggestions:

1) Excellent suggestion. We would like to add the following in the Introduction: "*While pressure and in-air gain corrections are typically applied, response-time correction is not done routinely even though errors can be of the order of 10 mmol m3 in the euphotic zone.*"

2) This is a good point. We will do so in the revised version of the manuscript.

3) We have done this analysis for idealized profiles and found a linear relationship (see figure pasted below). We will mention this in the revised manuscript.



In the second part of the manuscript, an attempt was made to estimate gross primary production (GPP) and respiration (R) from the oxygen data (corrected for the time response) measured by the floats deployed in the Gulf of Mexico. The authors found that due to the dynamic nature of the region (specifically due to near-inertial waves) and of its low productivity, it was not possible to estimate GPP and R using the oxygen data. While I enjoyed inspecting the figures related to this section, I was somewhat left unsatisfied by it. I would have liked to see depth vs. time sections of oxygen with plotted on top isopycnals, mixed layer depth and the depth of the euphotic zone. These sections would have allowed me (and the reader) to have a more clear view of the original data. Another question I had relating to the uncertainties found in the density-based estimates oxygen anomalies (Fig 9), is what would have changed if instead of implementing the time-response correction in pressure space you implementing it in density space? Or in other words, could the uncertainties in Fig 9 be due to the issue of pressure- vs. density-based correction?

Response: We will add depth versus time plots of oxygen in the revised manuscript. And, as stated above, we'll redo everything in density space.

Overall this second section made me think that it might have been best to divide the work presented in this manuscript into two different manuscripts: one on the time- response correction and the other on the GPP/R estimation. However, by no means I want to make this decision for the authors. I just think that a simpler, concise manuscript on the time-response correction would have been clearer. I'll leave to the authors to decide what's best for their work.

Response: This is a point we struggled with ourselves. In the end we settled on one manuscript because this work is the result of the MSc thesis research of Chris Gordon. He has now moved into a position outside of academia and is unable to dedicate the time and effort that would be necessary to fully develop two manuscripts.

A part from the above comments, I think this is a very good contribution that is definitely worth publishing in Biogeosciences.

Finally, I am very often wrong, so please let me know if I have misunderstood any of your arguments.

Best regards, Giorgio Dall'Olmo

Specific comments

I have few minor comments on the attached pdf. Please also note the supplement to this comment:

Response: Thank you for catching the typos. We will amend Figure 3 as requested.