ESSD response to Anonymous Referee #2
09/02/2022

Overview:

This paper by Loveday et al presents a method to estimate in situ net primary production based on automous gliders deployed for 17 months during the AlterECO project, and the subsequent data set.

I found the manuscript well written and clearly explained explained. In particular I appreciated the discussion about the different methods to correct non-photochemical quenching, their comparison and the discussion about the reason why a method clearly outperfoms the other ones.

I believe this data set is relevant for the community and important as well from a methodological point of view. Therefore I recommend the manuscript to be published in Earth System Science Data after some minor revisions.

Comments:

Without being an expert of the field, I am reflecting on the relevance of such a method for the open-ocean domain. I would like this question to be tackled in the manuscript in order to provide a generalizing view of the method. Some work on existing autonomous plaforms (Argo floats, glider) exist (eg Lavigne et al., 2012) to correct in situ fluorescence with surface satellite chlorophyll-a measurements. Could such an approach be used to contraint the glider based chlorophyll-a data? Would it be beneficial in the present case? Would another method for correcting the quenching perform better than the one used in the present paper?

(ref : Lavigne, et al. "Towards a merged satellite and in situ fluorescence ocean chlorophyll product." Biogeosciences 9.6 (2012): 2111-2125.)

As requested, we have expanded on the "Limitations, scope and future improvements" section of the discussion to include the points raised above, including reference to Lavigne, et al. (2012). Please see the final point in this response for more information.

Technical corrections:

l14 : To introduce the glider technology, please cite the community paper of Testor, et al. "OceanGliders: a component of the integrated GOOS." Frontiers in Marine Science 6 (2019): 422.

This reference has been added.

l99 : Is the 151 points correspond to a particular physical scale?

Firstly, we apologise to the reviewer, as there is a typographic error here. The smoothing window should read as 51 points, not 151. We have corrected this. Secondly, no, the number is not relevant to a general physical scale, but to this glider data set specifically. Changes to the glider sampling rate, such as when used in deeper waters or during longer missions, is likely to influence this number. The ingested data set was tested with a range of smoothing windows. A window of 51 points resulted in the most successful division of profiles. This value, (which, for reviewe'rs interest, represents approximately 5-10 minutes of glider sampling time) is small enough to allow smoothing to accurately capture the transitions between descending and ascending dive components, but long enough to reduce incorrect dive splitting due to short *inversions or "dwelling" at the top and bottom of dives. We have made a small addition to the paper to reflect this paragraph.*

l154 : (Saulquin et al., 2013)

This has been corrected.

l158 : (Lee et al. 2007)

This has been corrected.

l354 : while discussing limitation of the method, the case of offshore waters could be also discussed regarding the application of a similar approach to compute NPP estimates, and the required potential tuning of the method.

The following paragraph has been included at the end of the newly renamed "Limitations, scope and future improvements" section, in response to the point made above and in the comments;

Here, the methodology described is used to generate a primary productivity data set in an optically complex shelf-region. However, much of the basis of the methodology is derived from previous work that was developed for use in the open ocean context (e.g. Hemsley et al., 2015). Consequently, we expect that the NPP processor to be viable in the open ocean, where chlorophyll concentration tends to dominate the optical signal. In the open ocean, quenching methods based on calibration against the backscatter record are also likely to perform better, and, in the case of Hemsley et al., 2015, allow for dynamic calibration associated with changes in phytoplankton community structure. In addition, as Earth observation-based retrieval of chlorophyll concentration typically has lower errors in the open ocean it raises the prospect of using remotely sensed data to correct, and dynamically calibrate the in situ chlorophyll record, an approach previously suggested by Lavigne et al., (2012). It is important to point out that the methodology may require tuning when used in different mission contexts. With deeper and/or longer dives, care should be given to select the correct smoothing parameters to determine the turning points of the profile.