We thank the referee for the careful and insightful review of our manuscript and for all your suggestions and recommendations. Your work will help to improve the paper significantly. We took into account all the major points and concerns addressed by the reviewer. In the revised manuscript, the edited text is highlighted in red. We hope that this revised version is in agreement with your suggestions and suitable for publication in Earth System Science Data.

General comments

In the discussion section, analysis of the corrected salinity and dissolved oxygen datasets in their oceanographic contexts is provided, but this analysis is conspicuously absent from the pCO2 section. Instead only apparent differences between SD pCO2 and pCO2 from fixed stations is discussed. I'd suggest augmenting this section with some brief analysis; for example, what causes the increase in sea surface pCO2 toward the end of the experiment?

Thanks for the comment. A new paragraph and figure were inserted into the text to explain the Co2 trend throughout the experiment. To better understand the variability of pCO_2 this was compared with Temperature and Chlorophyll a data. In addition, the analysis of the processes observed throughout the experiment is the subject of a work in progress that will discuss pCO_2 variability in depth. Below the added paragraph.

To assess the representativeness of the pCO2 correction in terms of ecosystem dynamics, a comparison was made between the corrected pCO2, temperature, and Chl-a concentrations from satellites. The pCO2 in seawater is influenced by primary production, respiration, air-sea gas exchange, formation and dissolution of calcium carbonates, water mixing, riverine discharges and advection (Zeebe and Wolf-Gladrow, 2007; Bauer et al., 2013; Millero 2007), which leads to significant variations in different regions. The temperature affects the pCO2 through the thermodynamic dissociation constants of the carbonic acids, which directly affects the CO2 equilibria (eg. Millero, 2007) and to a lesser extent also the gas solubility.

Throughout the ATL2MED demonstration experiment, the pCO2 value (Fig. 11a) showed almost the same pattern as the surface temperature (Fig. 11b), and furthermore, the pCO2 values in the ETNA were lower than those of the Mediterranean at the same sea surface temperature. The main reason for this difference is attributed to the lower DIC in the Atlantic waters with respect to the Mediterranean (Alvarez et al., 2014).

We observed the highest pCO2 variability in the Mediterranean Sea , as the temperature increased by more than 15°C from winter to summer leading to an increase in pCO2 . A reduction in pCO2 due to phytoplankton photosynthesis is present at the end of the mission in the northern Adriatic where the fertilisation by nutrients carried by the Po river induced an increase in Chl-a concentrations (green line in Fig. 11b).

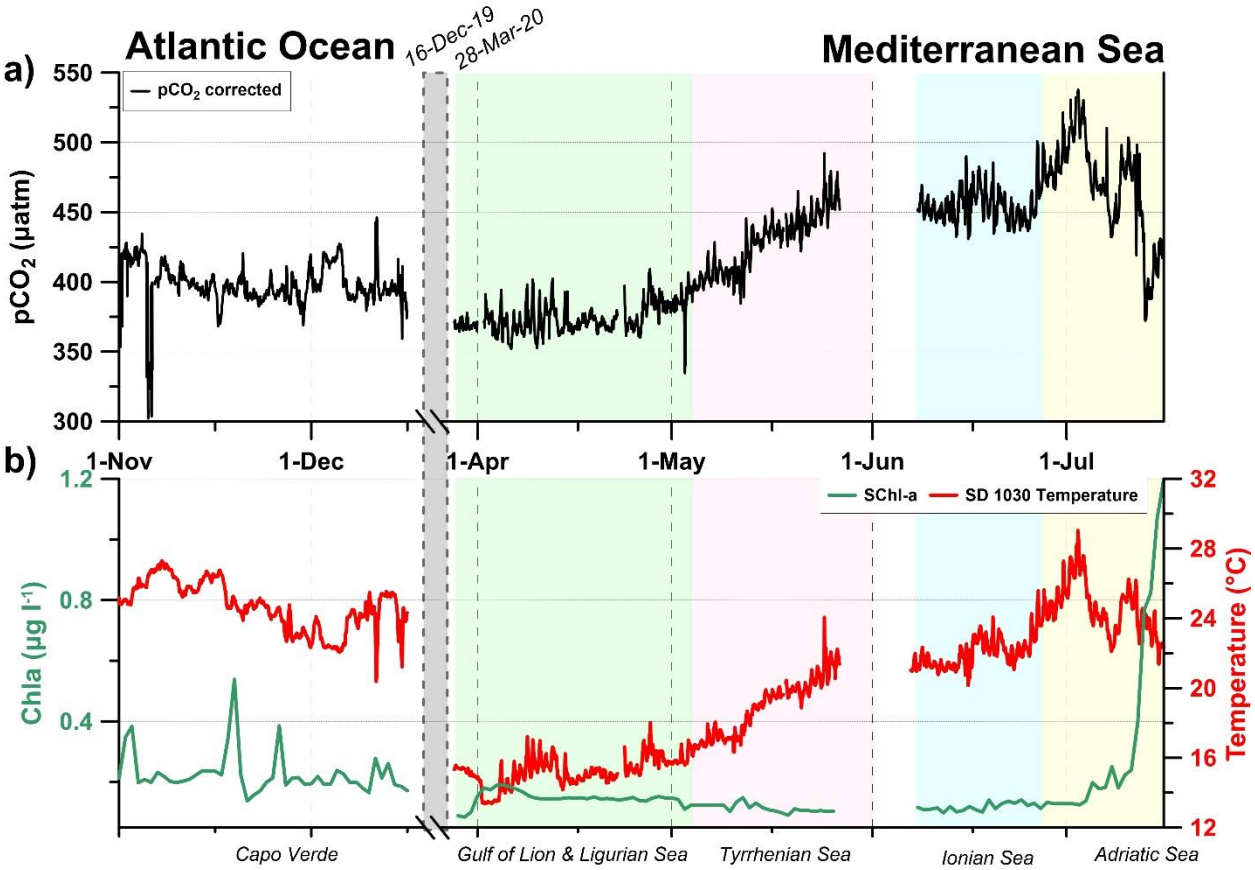

Figure 11.(a) pCO_2 and (b) temperature measured by the SD 1030 (red) and sea surface Chl-a concentration (from satellite in green) between 1 November 2019 and 8 July 2020. The x-axis was interrupted between 16 December 2019 and 28 March 2020 to highlight the Capo Verde area and the Mediterranean Sea, the coloured boxes evidence the different Mediterranean sub basins.

The 'Experiences and recommendations' section feels rather hastily written to me. The suggestions provided are good ones, but are sometimes repetitive and delivered in a way that is somewhat difficult to follow. I'd suggest revising this section for clarity.

Thank you for the clarification the paragraph has been changed as follows:

Our experiences and recommendations from the ATL2MED demonstration experiment can be summarised in the following bullet points, which are explained in more detail at the end of this paragraph:

We experienced that

- the SD sensors were exposed to severe biofouling
- a substantial amount of effort was required to correct the SD datasets
- some of the SD sensors were mounted in an unfavourable way
- the COVID-19 pandemic limited the access to ship time and thus impacts on the collection of discrete validation samples

We recommend to

- ensure a maintenance and cleaning frequency of the SD sensors and the hull that is adapted to the local environment
- use of biolimiting equipment at the SDs
- implement an automatic in air calibration procedure for SD oxygen measurements
- ensure that the SD sensors are mounted in such a way that they are exposed to open water
- ensure that a sufficient amount of independent measurements (*e.g.*, salinity, dissolved oxygen, carbonate system, Chl-a) are collected in the vicinity of the SD trajectories in order to validate the SD sensors

In general, the use of SDs requires considerable effort to ensure that the data are of scientifically usable quality, as these vehicles operate on the surface and are more exposed to biofouling. For future trials, a frequency of sensor cleaning and hull maintenance cleaning should be introduced depending on the monitoring area. In situations where this is not possible, bio-limiting devices should be used, such as UV systems and wipers powered by the solar panels that regularly clean the optical sensors. Experience from the ATL2MED demonstration experiment has shown that the SBE37 sensors appear to be reliable and robust with respect to biofouling. Regarding the dissolved oxygen correction, it is recommended to perform an in-air calibration as used for Argo floats to be able to correct the drift of the oxygen sensor more easily.

The ATL2MED demonstration experiment suffered from a lack of discrete samples for validation. Therefore, future experiments should be organised to collect discrete samples for acquired parameters at appropriate frequencies, which will greatly facilitate validation of the quality of the SD dataset. Finally, the suitability of SDs as a tool to validate other types of measuring platforms (e.g. fixed ocean stations, mobile devices or ships) strongly depends on various conditions, such as the distance to the platforms, the depth of measurements at fixed stations and the environmental conditions. All these factors need to be carefully considered to ensure the best possible data set for such a validation.

Line-by-line comments

52-53: Remove 'the' before biofouling: '…one of the most important is biofouling…'

Thanks for the suggestion, we removed the in the sentence.

Figure 1 caption: should this be 'glider sections'? Also, section is spelled incorrectly within the figure

Thanks we modified the figure accordingly with your comment.

102: Perhaps also cite Sabine et al. (ht tps: //doi.org/1 0 . 1 17 5 /JTECH -D -20 -0 0 10.1) when discussing the ASVCO2 system

Thanks for the correction. The references were added in the text.

111, 121: Not sure what is meant by 'open fixed station'. Should this be 'open-ocean'?

Thanks, we change open fixed station in open -ocean.

127: Define OGS here (this is the first mention in the text, besides the author affiliations). Also, in the next line, the authors have 'the OGS'. I'd recommend consistency: either 'the OGS' or just 'OGS'.

I apologise for not define OGS. In the main text we define it, and in the manuscript we use only OGS.

201-202: Grammar. Change 'allowing to' to 'allowing for the correction of'

Thanks for the suggestion, we modified the sentence accordingly to your comment.

275: Grammar. Change 'less' to 'fewer'

Thanks for the correction, we change less with fewer.

300: Can it be specified what level of uncertainty would have been assumed in the absence of these issues with the ASVCO2 instrument?

Thanks for the suggestion, we included a new sentence specifying the uncertainty. Below the added sentence.

Laboratory tests of the ASVCO2 system on SD platforms highlighted an uncertainty of less than 2 µatm (Table 3 in Sutton et al., 2014).

Figure 8d: x-axis label should be 'Latitude'

I apologise for this, we change Longitude with Latitude.

Figure 9b: y-axis label should be 'ΔpCO2'

Thanks for the correction. The label were changed.

Figure 10b: Can a line be added through the W1M3A values, like for the other datasets?

Thanks for the suggestion we modified the figure accordingly to your comment.

430-439: No mention of the pCO2 results in this paragraph?

We included a new paragraph (see the first general comment).

436: Could this be better stated as 'consistency in the corrected salinity values between both SDs'?

Thanks we modified the figure accordingly with your comment.

437: Could this be better stated as '…to correct the erroneous trend in O2 saturation %'?

Thanks we modified the figure accordingly with your comment.

455: Typo. 'substantial' amount of effort

Thanks for the suggestion, we add substantial on the sentence.

474: This is the first mention of RBR. Are these the optical sensors?

RBR is a company that manufactures oceanographic sensors, from physical to biogeochemical. For this experiment, RBR supplied sensors to measure temperature, salinity, dissolved oxygen and chlorophyll a. Oxygen and chlorophyll a are optical sensors. These sensors did not work properly during the entire mission, so it was decided to exclude them.

497: Author contribution section is incomplete

I apologise for not including it. The paragraph was included in the text.