

Review for Manuscript essd-2023-457 - CO₂ and hydrography acquired by Autonomous Surface Vehicles from the Atlantic Ocean to the Mediterranean Sea: data correction and validation – Martellucci *et al.*

**** General ****

The paper by Martellucci *et al.* presents a study of the correction applied to several biogeochemical parameters acquired by two SailDrone platforms during the Atlan2Med demonstration experiment. The two platforms sailed from the Eastern Tropical Atlantic Region to the North-Western Mediterranean Sea between July 2019 and October 2020. The authors have put together an interesting new dataset and reviewed choices regarding how and when data adjustments were done. Their findings show significant offsets between raw data and reference datasets from nearby cruises and stations. They arrive at a plausible set of conclusions and suggest useful corrections. The resulting paper could be a useful contribution to the literature as it is needed for deeper research, but I believe it should be returned to the authors for deep revisions and changes, as explained below.

**** Major comments ****

1. The manuscript has been submitted as an original research paper, but its content is rather technical and descriptive, and the discussion is quantitative rather than qualitative, and did “feel” technical. I recommend submitting the paper as a technical note, even if in its actual form, this is too long to be accepted in this format. The paper should focus solely on detailing the data qualification and correction, omitting particularly the site descriptions (already published), several figures, and tables that could be either completely removed or put to the supplementary material. This paper needs to be shortened and focused. In its current form (without real comparison or added-value), the paper does not meet the publication criteria.

2. My main concern in this paper is the corrections presented in Section 3 and the lack of robust statistics. It is not clear what hypothesis has been tested, nor which test is used. The authors need to include several other statistics (such as p-value, and RMSE) for their regressions. There is also no detail on how the regressions were determined (ordinary least squares I assume, but why is that appropriate for some parameters such as the temperature that has so few data points?). In Section 3.2 the authors claim several times that oxygen data have either a temperature dependence or independence and seem to construct the entire correction based on this observation (not statistically proven). It really does not look like that in Figure 4. This claim needs to be substantiated, and the methods used to determine this evaluation detailed. Based on the very little information given on methods and assumptions I do not believe these results are valid... and that leads me to question the analysis done using Argo data.

3. The quantitative aspects seemed, in places, potentially incorrect (i.e., the temperature and salinity data analysis). Comparisons with the literature are missing in a lot of places, leading to a confusing feeling about the accuracy of the corrected datasets. In other places, comparisons against data are done while it was stated previously that the data were either incorrect (Chl-a data) or acquired at a distance too far from the SD track (float data). A comparison with historical datasets would be a way forward to reduce this feeling of an incomplete and somehow superficial analysis. Generally, several references are missing, in both the discussion section and in the introduction to better describe the studied area and its characteristics.

4. Some of the figures are missing information, some others could be split and simplified, and the writing is difficult to understand in some places (but excellent in other parts). Some of the notation is inconsistent (see line-by-line comments). Globally, the paper looks like a gathering of diverse sections written independently, leading to a non-uniform written and graphic quality.

Ultimately, I was left uncertain of what to make of the results. This is perhaps a useful outcome for a future research paper, but several sections are either unclear, incomplete, or presenting correction methods that were already published and tested (i.e., the oxygen correction method) while it is stated that “alternative correction methods” are used in this paper. That said, the statements in the “recommendations” section are worth making to the community, so I hope the authors resubmit this paper after a deep re-work of it.

*** Minor issues ***

Abstract

L. 22: “... subject to varying .., and to biofouling”.

L. 24: several is a quantifier and maintenance is an uncountable noun, they do not fit together. Please replace either the first (e.g., some) or the second (e.g., repairs) and modify the verb accordingly.

L.27: Please put in situ (and all other Latin words as e.g. for example) in italic

L.33: I suggest rephrasing “for future experiments, a more frequent sample collection would improve the data qualification and validation”

L.34: I suggest removing this sentence as it is more or less self-evident that data are provided at the end of each paper

Introduction

L. 41. “. Among other improvements, fixed ocean stations and SOOP were equipped with..”

L. 45: “... larger scales, because of the very sparse ..”

L. 47: Not needed to put an s to ASV as Vehicles is already in its plural form

L. 56: “9-month-long”

L. 56: “... two wind-driven Saildrone ASV (SD) manufactured by Saildrone, Inc. (Alameda, CA) were used to ...”

L. 59: What do the “problems” refer to? Please develop

L. 61: “long-duration”

L. 65: On what basis is this “different marine ecosystems” statement assigned?

L. 67: How do you define “high-quality data” here? What is the reference?

L.69: What kind of processes? Are all the processes studied hereafter? I suggest here to develop and/or focus this sentence by adding a link to the results/discussion section

General comment on this Introduction section: References and citations are missing. Among other papers, the authors could cite, for example, Delauney et al., 2010 (10.5194/os-6-503-2010) for the biofouling effect, Tanhua et al., 2019 for the “observational gaps” (10.3389/fmars.2019.00471), Gentemann et al., 2020 for the SailDrone description (10.1175/BAMS-D-19-0015.1) or Goni et al., 2010 (10.5270/OceanObs09.cwp.35) / Lüger et al., 2004 (10.1029/2003GB002200) for the SOOP program / $p\text{CO}_2$ sensor implementation.

Experiment and data

Section 2: I suggest replacing with “Material” and dividing the text into two sections:

2.1 “Data collection and experiment” with a brief description of the Atlan2med experiment and of the Saildrones. I believe that this could fit into 2 paragraphs, especially as the demonstration experiment has been already published.

2.2. “Comparative datasets”. For each fixed station, several research papers have been already published. I suggest deeply shortening this section by adding references to published papers (“A more detailed description of the observation site can be found in...”). Except if the details of the station designs, sampling strategies, and analysis sequences/timing are not identical to the previously published papers, they do not need to be repeated here. I also suggest splitting this “comparative datasets” section rather by using the locations than the names, as proposed in Figure 1 (e.g., Liguro-Provencal basin facilities, North Adriatic region comparison sites...). Then, I would merge the glider paragraph with the LION and DYFAMED / W1M3A and E2M3A fixed stations parts into a Liguro-Provencal basin / North Adriatic basin sub-sections. This would reduce the text and clarify the locations of the sites and tools (especially because the glider transects are already cited in Section 2.2.).

L. 73: “... among numerous European academic institutions. A detailed description of the Atl2Med demonstration experiment can be found in Skejelvan et al. (2021)”. I would reduce this paragraph by not listing all the institutes involved in the experiment.

L. 73: What are the exact deployment dates for the SDs? Please add this information

L. 83: What kind of characteristics? Please develop

L. 86: I suggest starting this paragraph with the main aims of the mission and then rephrasing: “The aim of the Atl2Med mission was to (1) study eddies in the Canary Current upwelling system off West Africa jointly with a vessel-based research expedition (RV Meteor M160) and (2) to validate the CO_2 measurements acquired at 6 fixed ocean stations (CVOO, DYFAMED, W1M3A, E2M3A, Miramare, and Paloma). This monitoring experiment was achieved with sensors and instruments installed on the SDs, but also equipment deployed at a number of facilities that were used to correct data from the SDs (see Section 3). Table 1...”

L. 91: “.. Table 2 indicates when SD maintenance was performed”. I also suggest removing this table that is not needed as it could be summarized in 2 sentences.

L. 92: I suggest moving those two tables to the Supplementary Material (not crucial for the general understanding of the paper) “A detailed description of the instruments and sensors installed on the different features as well as their characteristics can be found in Tables 1 and 2 of the Supplementary Material”.

L. 93: “A detailed description of the Atlan2Med ..” (if the sentence is kept...)

L. 94. The citation should come earlier in the discussion, almost at the beginning.

L.98: Delete the “provided by Saildrone Inc.” that is already said in the Introduction

L. 98: Explain the CTD acronym

L.99: “. This study focuses primarily on sensors acquiring temperature, salinity, dissolved oxygen, and $p\text{CO}_2$ data.”

L. 104: Please add a reference for the ASVCO₂ system.

L. 109: Is the measurement frequency only for $x\text{CO}_2$ measurements or for all the parameters? Please add precision.

Section 2.2: The LION fixed station is not cited in the first Section 2 paragraph’ and it is unclear to me when those data have been used.

L. 131. “The main buoy”... That is?

L. 133-136: All those information about the sensors are given in Table 3. Also, the mooring line data are not used in the paper so the sentence about it can be removed.

Table 5: I suggest moving Table 5 to the Supplementary Material

L. 143: The paragraph could be shortened and cut after the “... online server.” sentence. All the other information are either given in the Table or not needed as papers about the infrastructure and the network functioning have been already published.

L. 157: Please add a reference for the HydroC system

L. 167: “.. transmit them”.

L.170, 182 & 189: Same as at lines 133-136

Section 2.6: I suggest modifying the title to “shipboard data” or similar. Also, please add the name of the campaign in this section (Meteor M160 cruise if I am right)

L. 194: Delete “furthermore”

L. 196: “Table 5 gives an..”. In the Table, the M160 cruise (or R/V Meteor) is not indicated. I suppose that it is what the Geomar name in the facility column refers to, but I suggest being more precise

L. 214: In the legend of the Table, DIssolved → Dissolved

L. 226: “The Copernicus ... et al., 2021) products. Daily data were...”

Methods

L. 235: “... intervention, salinity, dissolved oxygen, and Chl-a values ..”

L. 231-233: Please add references to support this statement

L. 239: Please add a comma between data and we focus

L. 240: $p\text{CO}_2$ data are not listed in the above paragraph as incorrect data... Conversely, Chl-a data are cited but do not seem to be included in the correction methods presented after. Please clarify

L.241-242 & Table 6: This description of the temperature sensor behavior should go earlier, before the list of all the parameters that need to be adjusted (line 235 I would say). What would be the explanations for these apparent temperature and salinity accuracy differences as the same sensor is measuring those parameters?

→ Worth pointing out that this 7-crossover comparison might not reflect the entire sensor consistency over its entire deployment time and is not statistically sufficient. A reference to the time-series plot (Fig. 4a) with the two SDs temperature records would be useful to highlight the stability and consistency of the signal. Here again, I suggest putting Table 6 in the Supplementary Material.

L.242 glides → gliders

L. 250: A space is missing between “... .1b), the SD showed...”

L. 249 & Figure 2: A superposition of the two SDs salinity time-series would support this statement

L. 256: “... and T5, salinity shifts of 1 were observed...”

L. 261: add a comma after correlation. How was defined this time/distance criterion?

L.263: What was the criterion to define the “nearest node”?

L. 265: “.. large time span since the last maintenance”. I do not agree with this statement that is incorrect for the SD 1053 considering the transects 3, 4, and 5, particularly (Fig. 2b).

L. 266: on the one hand... on the other hand... The comparison is incomplete, please modify or replace the adverb

L. 269: have shown

L. 274: The Gibraltar Strait

L. 276: "... variability. SD 1053 also showed considerable..." → What would be the explanation/hypothesis behind this observation?

L. 280: Remove the space between the model and the comma

L. 283: show

L. 284: "over the 60 days of measurements."

L. 289: ".. was of 0.26.". Also, here you give 2 digits for salinity values while there is only 1 digit given (and on Fig. 3). Please modify and harmonize.

L. 290: When? Which transect are you talking about?

L. 291: I am confused here, only Figs. 3i and j are cited but the transects 2 to 5 are listed...

L. 292: Mean differences? "..differences of" without the comma
It's confusing here as it is unclear if you are talking about the (mean?) differences or the offsets derived from the linear regressions...

L. 299: Where is the comparison with the fixed ocean stations?

Sections 3.1 & 3.2 are my biggest concern about the methods section. This regression analysis comes off as very sloppy. No statistics are given, only R^2 values. And for the R^2 values no information is given about the hypothesis tested and the test used... Trends are sometimes presented or cited but without the trend's values and/or uncertainties. There is no mention of how the trends are derived in Section 3.2 (though one would assume an ordinary least squares regression as in Section 3.1, which I'm not entirely sure is appropriate here (neither in Section 3.1)). Looking at the data distribution over time in Figure 3, I question how robust the regressions are so I'd like to see uncertainties for the regression line visualized. See for example Fransner et al (doi:10.5194/bg-2020-339) for an example of how to do this. There is some discussion around these results, but again quite superficial and that is for all the parameters cited/corrected. On lines 362-363, it is mentioned that similar periods of over and under saturation can be observed, but it is unclear what the relevance of that is and also where those saturation values were measured. This analysis needs considerably more care and interpretation before publication.

L. 298: I suggest adding a methodology section or at least some explanations about the method used, the tests done, and so on. Also, could you please indicate (maybe on the plots or in an additional table) the final offset and drift values obtained (+ the statistics)

L. 298 & 504: It seems that the US-English is used in the manuscript elsewhere → replace z by s

L. 302: Add a comma after temperature

L. 304: Add a reference here

L. 307: Something eastern is written with a capital letter, sometimes no. Please harmonize

L. 310: "... values. This procedure..."

L. 311: The reference Takeshita et al., 2013 is not in the reference list

L. 313: Please harmonize the units over the entire manuscript, especially for the oxygen. In Table 4, the sensor accuracy is given in $\mu\text{mol/kg}$ (molinity) while in Section 3.2 the $\mu\text{mol/L}$ (molarity) unit is used. The International System of Units in Oceanography (ISO) report published by Unesco (1985) recommended using moles per kilogram of solution for dissolved gases: "*For concentrations of dissolved gases units such as milliliter or cubic centimeter per liter at the reference temperature and pressure should also be discarded. Such concentrations should henceforth be reported uniformly in moles per cubic decimetre, or in moles per kilogram of solution. (p.120)*"

L. 315: "... 1053, respectively." Give the exact R^2 value

L. 315: Give the exact R^2 value. What is the statistical test used, and between which variables? An R^2 of 0.6 is quite high, is it not? Sixty percent of the variance in oxygen can be explained by temperature variations, thus, if I understand well, I do not agree with the statement "independent of temperature". I also feel this sentence is written oddly (I don't get really what the temperatures refer to). I suggest splitting this sentence into two. Fig. 4e and f refer to oxygen concentrations, not oxygen saturations...

L. 317: there is a space between °C and the comma

L. 322: What is the criterion defining "unreasonable" data?

L. 325: The authors stated (L. 322) that "no significant trend in sensors response" (according to Figures g & h it seems true) is observed (once again, what is the statistical test used here?) and then claimed that they want to "correct the negative trend". Please clarify and be consistent

L. 335: In the original vapor pressure of water equation (Johnson et al., 2015), the natural logarithm (ln) term is used while in the manuscript the logarithm (log) is written in the equation. Please check the equation and the calculations done.

L. 336: What is the unit for the volume fraction of oxygen, what is the value used? If it is a constant value (I believe that it might be 20.946 ± 0.002 percent), then the authors should write it

L.335, 338, 340 & 343: I suggest numbering the equations. Also, what are the units?

L. 339: G is the gain factor/gain correction.

L. 339: "The Epp was..."

L. 341: The term SD_{csd} does not correspond to the what is written in the equation. I suggest clarifying this sentence here as follows "The corrected oxygen concentration (O_{2csd}) from the SDs was calculated...". Data is a plural noun → "are/were" (and elsewhere in the manuscript). When SDs oxygen data not corrected are used, I suggest specifying "raw data" ("... from adjusting raw oxygen data measured by the SDs..").

L. 344: Here again, the sentence is very confusing and does not correspond to what was written previously. It is clearly stated in L. 316 that there is no temperature dependency... From my understanding, the purpose of the correction is not to detrend a time-series (that would imply a consistent drift/change over time, which is not the case here (Fig 4 g-h)) but to correct oxygen sensor instabilities and drifting over time as the gain factor is updated to correct for temporal drift.

L. 346: How these dissolved oxygen saturations deterministic (I assume) trends were removed?

L. 348-353: Here again, it is unclear how dissolved oxygen data were detrended, how the relationships were calculated, what the statistical relevance of the calculations was... The last correction step (i.e. the biological activity effect removal) relying on the assumption that only biological processes drive the O₂ content variability seems to induce an over-estimation of these processes as air-sea O₂ fluxes and physical structures (convection, eddies) could significantly impact the O₂ reservoir. A more detailed discussion (is it in agreement with the literature?) about this assumption (and its associated error) would be at least a way forward to add confidence. I am also unsure about the data used here... I would use the corrected oxygen data and then derive the residual values, as I have the feeling that otherwise an overestimation of the biological activity could occur.

Section 3.2: The conversion between equilibrium partial pressure, pO₂, and seawater O₂ concentration, depends on the seawater salinity (see Bittig et al., 2016 & 2018). Was this salinity correction done?

L. 360: Remove “the” Spring 2020.

L. 361: Why is it “particularly interesting”?

L. 366: I would remove the term “sensor” before “pCO₂ measurements” as it could lead to confusion with the SD pCO₂ system and suggest another term like “fixed-sites pCO₂ measurements” (feel free to ignore this comment, this is a matter of personal perception). At least please harmonize the nomenclature over the entire paragraph (line 380 they are called “stations sensors”)

L. 368: “... Atlan2Med cruise/campaign/experiment”

L. 370: Please develop this “minor variability”

L. 376: Depending on the input variables/combination used to derive the pCO₂ (as well as on the equilibrium constants), the uncertainty could vary a lot, from ± 1.8 µatm to ± ~6 µatm (e.g., Millero, 1995, Orr et al., 2018). Please justify your choices.

L.377: Please develop the “the hydrogen fluoride constant KF” and put the F as a subscript

L. 378: Please put the letter “p” in italics (and elsewhere in the manuscript)

L. 394: “... (in µatm)”

L. 397: Considering Figure 6b, is it still accurate to consider an associate uncertainty of ± 5 µatm?

Section 3.3 and 3.4: I would suggest putting them as sub-sections (3.3.1 & 3.3.2) as a bigger one merging them and entitled, for example, “Correction and adjustment of $p\text{CO}_2$ data”. I would thus rename Section 3.3.1. to be more precise “Fixed-sites $p\text{CO}_2$ data acquisition and qualification”.

Results and discussion

Section 4.1: For salinity data, the correction is discussed in this “results and discussions” section while for the other parameters (oxygen and $p\text{CO}_2$), corrected data are already presented and discussed in the Methods section. Please harmonize the data presentation.

L. 404: Add a comma after “(T1)”

L. 407: “The salinity correction induced an over-estimation /over-estimated the salinity values. Instead, raw salinity data were in ...”

L. 411: Please add a reference to the plot you are referring to.

L. 411: “with respect to”

L. 414: “... (Fig. 7e). The corrected salinity ...”

L. 418: “... between the E2M3A fixed ocean station ...”. In this sentence, you are comparing a structure itself to data. Please be clear: “fixed ocean station dataset and glider measurements”

L. 420: “poor”: I suggest removing those kinds of subjective adjectives that are uncountable and sound not scientific. Replace by “non-significant” and present a strong argument (statistics)

L. 422: This plot does not show trends! Please use the words temporal changes, variations, (similar) dynamics

L. 423: “... June 1st... April 27th ...”

L. 426: “... are consistent... ; differences being mainly due to the distance ...”

L. 428: “Considering that during T1...to apply the salinity correction after this transect.”

L. 432: “... discrete dissolved oxygen measurements were not available ... Thus, the SD corrected ...”

L. 435: Please name the two locations chosen

L. 436: L. 235, the authors claimed that Chl-a values showed inconsistencies, while here they are used. It leads to confusion: I suggest moving L.460 upward
Moreover, this analysis comes off as very simplistic as it relies only on a visual inspection

L. 439: Please add a reference to support this statement

L. 440: Here again, please add concrete data to support this “strong linear correlation” statement

L. 441: What does this “slightly lower/higher” represent? Please add a reference

L. 444: Is it always the case? Even during intense wind episodes? (Ulses et al., 2020)

L. 446: Are the authors describing here the oxygen saturation in the Mediterranean Sea? I suggest applying this example/sentence to Mediterranean Sea data

L. 449: How is the evaluation done?

L. 451-452: The DOI can be removed from the main text and put in the data availability section

L. 456: Same remark here for the dates than at Line 423

L. 457: were high

L. 458: “... lines). The optical sensors on the SDs...”

L. 461: “... needs weeks ..”

L. 462. “We refer to...”. Please remove the thus

L. 464: Please explain the link between Chl-a data and the temperature, or at least modify the sentence as you are starting with “the patch of high Chl-a” and continuing with “evident in sea surface temperature”.

L. 482: The decrease in oxygen is not observed for both SDs, only on the SD 1053 time-series.

L. 488: A reference would be appreciated here to support this statement

L. 494: A brief discussion about this relationship, varying regionally, and its consequences (i.e., the T sensitivity is larger in colder regions and lower in the warmer tropics) would maybe be interesting here (see Gallego et al., 2018)

L. 500: What were the input variables at the other sites? What would be the uncertainty associated with the other difference estimates?

L. 504: Would it be possible to estimate the impact of those processes?

Data availability

Section 5 & Table 8: I suggest moving this section and the table to the Supplementary Material. In Table 8, please split the DOI column into two columns, one only with the DOI and the other with the references.

Summary

L. 519: “... covering both the Eastern Tropical North Atlantic region ...”. Also, as the ETNA region is cited numerous times, maybe the acronym could be used here and previously

L. 529: sensors on the SDs (also L. 531, 556, 562). Moreover, what is corrected is not the sensor itself but the data produced by it. Please correct

L. 531: I do not agree with this sentence: the oxygen data correction method is not new (Johnson et al., 2015, Bittig et al., 2018)

L. 533: "... data sets that are available...". Please harmonise the way the word dataset is written over the entire manuscript (sometimes with a space, sometimes no)

L. 535: the paragraph begins with a reading out of the limitations, but it seems that there is only one issue considering the rest of the paragraph. I suggest rephrasing or modifying the first word

L. 536: "... cruises, etc."

L. 538: "Consistent" is an overstatement as no statistics are associated with the results. I also suggest rephrasing the sentence as it is more or less written two times that the consistency is fine...

Future and recommendations

L. 549: I would move the beginning of this Section from line 544 to 549 in the conclusion section, reducing its content and rephrasing some parts of the conclusion to fit in. Indeed, no recommendations or pieces of advice are given here, only a repetition of the previous statements

L. 556: The RBR acronym is not defined in the manuscript

L. 565: Please rephrase... "the sensor mounting should ensure that the sensors are mounted" sounds repetitive

L. 566: "... from a lack of ..."

For this section, I would suggest summarising the recommendations via a bullet list or at least by numbering them. It would clarify what the improvements from this experiment are based on your observations, which is unclear in the current Section 7

*** Figures & Tables ***

Figure 1: The bottom panel seems to have been warped. Please add on this one some indications about the oceans/seas, countries, and the lat/long information for the x/y axis. For the upper panel, the legend is incomplete: Argo float symbols and the two SDs colors are detailed, but the symbols for the fixed-stations, the glider, and the research vessel are not explained. I suggest adding on the small maps the names of the fixed sites and small dashed lines to link the "zoom windows" to the small squares on the map. I also suggest shifting them a little bit to better show the main map.

The two blue lines (T1 & T2) are superimposed, but I thought the two SDs were deployed at the same time... Also, the transect cutting is incomplete: to what are the data (SD 1030) between December and January qualified/associated with?

Table 2: Not needed, could be completely removed and replaced by 2 sentences in the main manuscript. Also, the backslash (\) is not in the same direction as the others in the manuscript (column 1 first box)

Table 3: In the main text, SBE16 plus is written with a +. Please standardize. Make uniform the units too, with either a -1 as a superscript or a /

Figure 2: Would be useful to add on the Figure the transects (T1, T2, ...). Please modify the legend “.. and Argo float data..”. The legend on the figure (i.e. stations) is confusing as it could refer to the fixed station sites described before. Please clarify. I also suggest adding a sentence in the main manuscript stating that in the manuscript salinity values are expressed in PSU (then remove this unit in the figures).

Figure 3: The y-axis is not labeled (ΔS ?). Also, I suggest harmonizing the y-axis range/scale to avoid confusion. What is the statistical test used? See my previous comment about that. Colors for each SD are not the same between Figure 2 and Figure 3 (blue and purple against black and red): please harmonize. A map on the side would be relevant to better visualize where the data were acquired.

Figure 4: It seems that the red color is used for the SD 1053 and the black one for the SD1030, but in panels g and h it is the reverse. Please harmonize. I suggest reducing this Figure by (1) putting the temperature panel with Figure 2 (as temperature data are cited earlier in the paper at the beginning of Section 3, (2) removing the panels e and f (not necessary, could be put in the Supplementary Material) and (3) moving upward the panels e and f as this section is first and foremost dedicated to oxygen data. I also suggest adding the statistical results to these panels. In Figure 4b, please reduce the thickness of the black trend line as the grey one is currently not visible. The y axes are not completely labeled (Oxygen Saturation (%), O_2 ($\mu\text{mol/l}$)). What are the dashed grey lines?

Figure 5: The y axes are not completely labeled (Oxygen Saturation (%), O_2 ($\mu\text{mol/l}$), temperature...). In Figure D, the legend box is on the x-line. I suggest reducing a lot this figure by removing some panels (e.g. the detrended and not detrended, especially as it is unclear in the main manuscript...). Once again here, I suggest moving the “corrected O_2 data” time-series plot to the top as this is what this section is about. Please harmonize the legend in the boxes (correction/corrected...). In the legend, please correct “back \rightarrow black”

Figure 6: I suggest completing the y-axis for panel b by adding Δ (i.e. $\Delta p\text{CO}_2$ (μatm)) to avoid any confusion with panel A.

Figure7: Colors are almost indistinguishable on the upper panel (Fig. 7a). I also do not think that it is relevant here to plot the model salinity data as SD data were corrected using them... They obviously more or less match them. I suggest not presenting the data with multiple panels as it is done now (corresponding to certain transects) but rather using the current panels A and B and adding the other reference measurements on them. If they are bigger the dots will be big enough and the main message clear. Thus, it would delete the panels c to g. Please also use another for the floats and the glider data (both of them are yellow...). Following the text structure, I would first present the data recorded by the SD 1053 (first discussed) and then by the SD 1030. Numbers on the panels (corresponding to the distances) are unreadable. If the authors want to keep the panels as they are currently, I suggest at least using the same y-axis scale (Fig. 7 c-e).

Figure 8: Units are missing. The y-axes as well as the colorbar are incomplete. The legend is incomplete too as the second y-axis in Figure 8b is not explained.

Figure 9: One panel is enough for both the sea surface temperature and the vertical section. It is not needed to put the three dates as the plots are similar. Here too, units are missing. The y-axes as well as the colorbar are incomplete. The addition of the SDs pathways on panel C would be useful to understand the differences in O₂ concentration observed between the two platforms.

Figure 10: Are *f*CO₂ data used or *p*CO₂? The legend is not in agreement with the plots and Section 4.3. In the boxes, please write *p*CO₂ rather than CO₂. In Figure 10B, why dots (that are indistinguishable) are not linked?

Table 8: A “E” is missing line 6 column 3 “MOOS program”. I suggest renaming the first column “Platform” or similar

Generally, the number of plots (that is too high!) for each parameter studied is not well balanced. Even if it does not have to be equal, there is a strong disproportion among the figures, with for example 4 figures for the salinity, 15 for the oxygen, and only 2 for the *p*CO₂ in the methods section.

General remark: Please have a look at the colors used for all figures and make sure they are colorblind-friendly (I do believe that it is not the case for Figures 8 & 9).