

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2022-402**

Anonymous Referee #1

Referee comment on "Ocean cross-validated observations from R/Vs *L'Atalante*, *Maria S. Merian*, and *Meteor* and related platforms as part of the EUREC⁴A-OA/ATOMIC campaign" by Pierre L'Hégaret et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-402-RC1>, 2023

General comments:

The manuscript describes an impressive observational effort in the tropical western North Atlantic. Four research vessels joined in the EUREC4A-OA experiment and conducted measurements in the region, when also deploying autonomous vehicles. A wealth of data was acquired, based on a multitude of different sensors.

I really appreciate the effort taken in this manuscript; combining data of various sources in order to assess their quality needs thorough procedures and considerations, as described here. Nevertheless, I think the manuscript should be improved in a few points:

- Make sure to address clearly which data are considered here and which are not. Especially, say at the beginning of the manuscript that no data from US Ronald H. Brown were analyzed and less data from Meteor were available (e.g. no L-ADCP, uCTD). Meteorological sensors are not addressed. It is valuable to inform the reader that EUREC4A-OA included more measurements than presented here, but it is also necessary to give an overview of the data analyzed here at the very beginning. Readers need to know what to expect.
- Additionally, the point that no lab samples for salinity and oxygen were available for CTD calibration on Meteor must be placed more prominently. Maybe it is possible to say why the salinity samples were not analyzed? It is very unfortunate. However, especially in the Calibration and Observation chapters (Sections 2 and 3) text is written as if procedures apply to all three vessels. This is not the case. See more specific comments below.
- Following the point above, it would be interesting to see a comparison of the profiles which were taken nearby the Meteor CTD (ln 194-196). Figure 4 is not sufficient in addressing the error of the Meteor CTD. The description needs a figure with all profiles conducted in close proximity, with a focus on the deeper part of the water column where variability is low.

- The figures generally include the distance class up to 100 km. I would not expect much similarity in profiles with so much distance between them. I think the more informative class of up to 25 km distance should get more space and the ranges of the axes in the figures should be zoomed to a smaller range. In other words, I don't get what we learn from the large distance comparison, no conclusion regarding sensor error is possible from these pairs. Maybe we need them for Argo, where distances and errors are larger in general, but for CTD, where errors are small and reliability is high, I recommend to focus on the profiles which are close to each other, even when there are only few pairs.
- Figures of the type Fig. 14 d,h,j should include information on the amount of data used to calculate the mean and standard deviation.
- References are often too short, no doi is given and sometimes there is no hint on where to find the papers (e.g. Otsuka et al. or Branellec et al.). Some should be available online, please provide links. Is Le Bot et al. only available in French? Please provide an alternative if possible.

Since the lists above and below are rather long, I suggest a major revision of the manuscript.

Specific comments:

Ln 2: change "large-scale currents" to "regional currents"; large scale gyres are not considered here

Ln 7: add "up to 400-2000 m depth" – otherwise, readers may think that the surface (0-400 m) was not covered

Ln 15: the reference points to the dataset from L'Atalante and Maria S. Merian, however, in the first paragraph four vessels and various platforms are mentioned. Define more clearly, which data are considered here (see major comments).

Ln 28-33: the paragraph seems a little out of place and focus. It is neither a full description of the working region, nor a broad overview. Add a sentence on the

importance of the AMOC for the interhemispheric exchange, connecting the tropical South and North Atlantic, and the role of NBC rings. Give references (the only reference to a paper on the region is given in line 290, which is out of place as well). A map with currents would be helpful as well. The division in two regions "east of Barbados" and "to the south" is not conclusive either, what about the rest of the box in Figure 1 (north and west of Barbados)?

Ln 45: Assuming that the lab at IFREMER is shallower than 2000 m, the derived uncertainty is probably for a certain pressure, thus 2000 dbar?

Ln 151: no lab calibration was done before and after (?) the cruise

Ln 161: I guess there were also two SBE4 sensors? Please clarify

Ln 170: add "in" before Hood et al.

Ln 216 ff: What about Meteor? Did the Meteor CTD measure oxygen, with one or two SBE43 sensors? What happened to the data?

Ln 229: "each ship" – no, Meteor was not equipped with L-ADCP, see line 135

Ln 239: I don't think it is reasonable to call the procedures for salinity and oxygen similar for all three vessels. Ideally, this would be the case, but many differences are listed in the text above. The most important flaw is of course the missing samples from Meteor.

Ln 248-250: move to the beginning or very end of the subsection, it seems out of place here. Why -9?

Ln 266: does this statement refer to all measurements described in this subsection or to PAR sensors only?

Ln 270: again, excluding Meteor

Ln 277: I do not understand why the positioning of the CTD station was different. Please

explain.

Ln 279: It is an important result that the methods agree in the final dataset. Please give more details on "no major differences" and add a figure, showing calibrated profiles from the two toolboxes.

Ln 286/287: excluding Meteor

Ln 294: it would be nice to have a table listing the final uncertainties. What uncertainty was assigned to the Meteor data?

Ln 300: one CTD profile

Ln 312: measure

Ln 314 ff: what about Meteor? Were water samples taken and analyzed?

Ln 404: does not apply to ship CTD, delete

Ln 407: what was the cut-off frequency?

Ln 431: Hz

Ln 438: the term "calibrated" does not apply to S-ADCP data. They are processed.

Ln 458: "all were equipped with Seabird CTDs" contradicts line 448 (Kraken). What are the uncertainties for the IFM and UEA gliders?

Ln 460: "some devices" – please specify which devices

Ln 472: "than 30 km" is doubled

Ln 475/476: use "larger" or "higher" rather than "stronger"

Ln 476 ff: I cannot follow the conclusion here. When the profiles of the pairs are in close vicinity to each other, variability should be small. Cannot be the missing calibration of the Meteor CTD (no salinity samples) be the cause of the large differences for the UEA gliders, which are mainly based on comparisons with Meteor?

Ln 479: delete)

Ln 488: Figure 14 j

Ln 490: was the bias corrected? What is the final uncertainty and level?

Ln 532: add "in" before Argo

Ln 534: the value $2 \cdot 10^{-4} \text{ } ^\circ\text{C}$ seems to be unrealistically small

Ln 552/553: what is the meaning of $5^{-3} \text{ } ^\circ\text{C}$ and 5^{-2} psu ?

Ln 571: add CTD error for consistency

Ln 579: second column

Ln 599: add "in" before Eaton et al.

Ln 602: what about Meteor S-ADCP data?

Figure 2: add TSG to the figure (e.g. as a point in the lower left corner)

Figure 9b, 11b: Shown are calibrated profiles, please clarify in the caption

Figure 10b: in the caption, delete the extra s in "R/Vs Maria S. Merian"

Figure 17a: caption: "specific"