Response to Reviewers' comments on the manuscript:

A synthesis of SNAPO-CO2 ocean total alkalinity and total dissolved inorganic carbon measurements from 1993 to 2022, Nicolas Metzl et al., MS No.: essd-2023-308, MS type: Data description paper

Reply to Reviewer 1 (in purple from reviewer, in black our reply)

Review 1: posted 15/9/23
The paper by Metzl et al. presents an impressive data synthesis product, encompassing measurements of dissolved inorganic carbon, total alkalinity, and other hydrographic variables collected from both open ocean and coastal regions, as well as the Mediterranean Sea. These data were assembled within the context of various French research initiatives. Overall, the paper is very well written and the data product will contribute significantly to enrich the global ocean carbon observational database. It should be published in a timely manner after incorporating some changes as laid out below.

Reply: We thank the reviewer for her/his enthusiastic support.

Major comments:

1. I recommend dividing the paper into two distinct publications. The first should focus solely on detailing the data product, omitting Figures 8 through 14 and their associated discussions. The content suggested for removal would be more fittingly explored in a separate, specialized paper. Alternatively, they can be put into the supplementary.

Reply: We are not sure to understand the suggestions for two publications (not suggested by reviewer 2). The aim of this manuscript is to describe the data assemblage, the data quality control and to discuss some potential uses of this dataset. We would like to keep the structure of the paper with Figures 8 to 14 as examples for different analysis based on this new data set.

Other publications with specific topics (e.g. detail of seasonality and long-term trends at regional scale, analysis of meso-scale distribution and processes, etc..), would be dedicated for regional analysis with the support of other data and methods not presented here (e.g. Oxygen, nutrients, BGC-ARGO, Gliders, NN methods, models versus data, etc…). Here we think the selection of few figures and discussion is appropriate for potential users. Several figures were in the Supp Mat.

In short, figures 7, 8 (for global) and figure 11 (for the MedSea) present the data (here specifically when one merge different cruises). Figure 8 presents the AT and CT data along with T, S and depth (T and S properties also included in the database with their flags).
Figures 9 and 10 aimed at presenting large scale views of some derived properties (here we have selected only Revelle and Omega-Ar as example, not pH or Omega-Ca or pCO2).
Figures 12 and 13 are examples of trends in surface or at depth for few selected regions and specifically when one merges different cruises (figure 13).

This is in line with other publications of datasets in ESSD (Fassbender et al 2018; Reverdin et al, 2018 Gattuso et al 2023; Sims et al, 2023) and we keep the structure of the manuscript as submitted. Note that we did not include any comparison with methods or models as this was done in other publications, some cited in the manuscript (e.g. Lajaunie-Salla et al 2021; Chau et al, 2023 ESSD; Ulses et al, 2023 for DYFAMED time series and MedSea data; Thomas et al 2008; Keller et al, 2012; Signorini et al 2012 for SURATLANT data).

2. Please follow the same format as GLODAPv2 as much as you can. Consider making the data available in *.mat and *.nc as well. Folks with routines to import the GLODAPv2 data product should be able to adapt their routines for this new product easily.

Reply: the format of the files somehow follows the GLODAPv2, specifically for the quality flags (and also same as in SOCAT). As suggested we will add new files in Seanoe portal (and NCEI/OCADS) with .mat and .nc format for users.

3. Following GLODAP and SOCAT, please consider making this data product available through the Ocean Carbon and Acidification Data System (OCADS) at NOAA/NCEI. Doing so would enrich the product with a community-driven comprehensive metadata template, enhancing its utility and accessibility. Additionally, it would secure the benefit of a long-term archive with version control.

Reply: The data are presently secured at Seanoe and thus publicly available in a simple format. As recommended by the reviewer we will also send the files to OCADS. We have contacted NCEI/OCADS (10/10/23) and they will accept the dataset. We also indicated in the letter to the editor that once published, the files would be included in the ad-hoc GOA-ON data portal (SDG14.3.1, https://oa.iode.org/) as was previously done for data from cruises OISO, OVIDE, SURATLANT, CLIM-EPARSES.

4. Each of the individual cruise data files should also be published in a data assembly center and made publicly available.

Reply: Not sure to understand this point. As listed in the Supp Mat (Table S4), we added links of individual data files when already in a data center. Here we have synthetize the observations in only two files for easy use of these AT and CT data for the community.

5. In terms of nomenclature, please adhere to community-accepted abbreviations as outlined in Jiang et al. (2022, https://doi.org/10.3389/fmars.2021.705638). For example, use DIC instead of CT, TA instead of AT.

Reply: We prefer using the abbreviations AT and CT as recommended in the SOP (Dickson et al 2007) and used in other publications (e.g. Gattuso et al, ESSD, 2023).

Minor comments:

- Throughout the manuscript (ms): data-base --> database
Reply: Thank you, done

- Throughout the ms, pCO2 or fCO2, the p and f should be italicized.
Reply: Thank you, done

- Line 59: PgC is a unit, instead of a substance. Please add "anthropogenic carbon dioxide".
Reply: Thank you, suggestion added.

- Line 61, atmospheric CO2 is commonly reported as ppm, which is a molecular ratio, instead of a "concentration". Consider replacing it with "level" or something more appropriate. According to the IUPAC Gold Book, concentration is associated with a per-volume based unit.
Reply: Thank you, suggestion added.

- Line 65: Replace Revelle and Suess 1957, with papers that actually report these changes, e.g., DeVries, 2022; Jiang et al., 2023.
Reply: References Jiang et al 2023a added as suggested.

- Line 78: has --> have.
Reply: Corrected.

- Line 81: add Lauvset et al., 2022
Reply: References added on line 81 and in references (also commented by reviewer 2).

- Line 85: data-base --> database
Reply: Corrected.

- Line 85: add these new studies,
(a) Ma et al., (2023), ttps://doi.org/10.1029/2023GB007765;
(b) Feely, R. A., Jiang, L.-Q., Wanninkhof, R., Carter, B. R., Alin, S. R., Bednaršek, N., and Cosca, C. E. (2023). Acidification of the global surface ocean: What we have learned from observations. Oceanography, https://doi.org/10.5670/oceanog.2023.222.

Reply: Thank you, we are aware these studies. Ma et al (2023) was already in references. To our knowledge Feely et al (2023) is not yet available online (on 18/10/23) but should be soon and thus now added in references as suggested.

- Line 86: add Carter et al., 2021, https://doi.org/10.1002/lom3.10461.
Reply: Here we referred to methods for reconstructing both AT and CT. As Carter et al (2021) reconstructed only AT we did not listed this paper, but it is referenced on line 1100. Now also added on line 86 as suggested.

- Line 90: data-products --> data products
Reply: Corrected and in other lines.

- Line 107: spell out SOCOM
Reply: SOCOM was spelled out after, now moved before the acronym.

- Line 116: add Ma et al. (2023) and Feely et al. (2023). For more details, see above.
Reply: References added

- Line 122: 2013b --> 2023b
Reply: Thank you, corrected

- Replace data citations with citations to the paper. That will allow readers to access more information of the product.

For example:

Jiang, L.Q., Feely, R. A., Wanninkhof, R., et al.: Coastal Ocean Data Analysis Product in North America (CODAP-NA, Version 2021) (NCEI Accession 0219960). [indicate subset used]. NOAA National Centers for Environmental Information. Dataset. https://doi.org/10.25921/531n-c230. Accessed [date]. 2020.

Should be replaced with:

Jiang, L.-Q., Feely, R. A., Wanninkhof, R., Greeley, D., Barbero, L., Alin, S., Carter, B. R., Pierrot, D., Featherstone, C., Hooper, J., Melrose, C., Monacci, N., Sharp, J. D., Shellito, S., Xu, Y.-Y., Kozyr, A., Byrne, R. H., Cai, W.-J., Cross, J., Johnson, G. C., Hales, B., Langdon, C., Mathis, J., Salisbury, J., and Townsend, D. W. (2021). Coastal Ocean Data Analysis Product in North America (CODAP-NA) – an internally consistent data product for discrete inorganic carbon, oxygen, and nutrients on the North American ocean margins. Earth System Science Data, 13(6), 2777–2799. https://doi.org/10.5194/essd-13-2777-2021.

Reply: Thank you, corrected and on line 1113.

Reference in this review not listed in the MS:

Thomas, H., A.E.F. Prowe, I.D. Lima, S.C. Doney, R. Wanninkhof, R.J. Greatbatch, U. Schuster and A. Corbière, 2008. Changes in the North Atlantic Oscillation influence CO2 uptake in the North Atlantic over the past two decades, Global Biogeochem. Cycles, 22, GB4027, doi:10.1029/2007GB003167

Signorini, S. R. , S. Häkkinen, K. Gudmundsson, A. Olsen, A. M. Omar, J. Olafsson, G. Reverdin, S. A. Henson, C. R. McClain and D. L. Worthen, 2012. The Role of Phytoplankton Dynamics in the Seasonal and Interannual Variability of Carbon in the Subpolar North Atlantic:¬ A Modeling Study. Geosci. Model Dev., 5, 683-707, doi:10.5194/gmd-5-683-2012

Lajaunie-Salla, K., Diaz, F., Wimart-Rousseau, C., Wagener, T., Lefèvre, D., Yohia, C., Xueref-Remy, I., Nathan, B., Armengaud, A., and Pinazo, C.: Implementation and assessment of a carbonate system model (Eco3M-CarbOx v1.1) in a highly dynamic Mediterranean coastal site (Bay of Marseille, France), Geosci. Model Dev., 14, 295–321, https://doi.org/10.5194/gmd-14-295-2021, 2021.

Keller K., F. Joos, C. Raible, V. Cocco, T. Frolicher, J. Dunne, M. Gehlen, L. Bopp, J. Orr, J. Tjiputra, C. Heinze, J. Segscheider, T. Roy and N. Metzl, 2012. Variability of the Ocean Carbon Cycle in Response to the North Atlantic Oscillation. Tellus B, 64, 18738, doi:10.3402/tellusb.v64i0.18738.