

We would like to thank Anonymous Referee #3 for the thoughtful review and the constructive feedback provided. We have carefully considered all comments, as detailed in the attached document.

We appreciate the helpful comments from the reviewer #3 that help to improve the readability and coherence of the manuscript. The reviewer comments are listed below with the italicized responses following. Changes to the manuscript and their associated line number are highlighted in blue text.

RC3: '[Comment on essd-2025-759](#)', Anonymous Referee #3, 31 Jan 2026

The current manuscript describes CARIMED and the workflow and general approach behind it. CARIMED comes as two datasets that collect research cruise data of inorganic carbon and/or transient tracers in the Mediterranean Sea from 1976 to 2018, reformatted to a common, typically used format in the field (WHP) and made internally consistent. The procedures underlying this effort of data harmonization, quality control, and bias identification and adjustment (1QC, 2QC) are described in detail and follow state of the art techniques, e.g., those developed in GLODAPv2. Where necessary, they were expanded and adapted to the regional MedSea peculiarities, e.g., by focussing on specific water layers of low variability. The outcome is a benchmark and go-to dataset on MedSea carbon and ventilation dynamics, that will help re-define understanding of the interior Mediterranean carbon dynamics and beyond (e.g., as reference for adjustment of sensor-based observations through improved regressions, e.g., like CANYON-MED). The manuscript is well-written and it is easy to follow the line of thoughts and arguments.

Behind this data set description paper stands an enormous work of tracing, finding, and recovering historic data as well as harmonizing data across 4 decades. The authors are to be commended for this work as well as for their comprehensive description (incl. historical background, e.g., section 4.3, which is extremely important to allow informed use of the data).

We thank Referee #3 for their positive comments and for recognizing our efforts. We hope that the CARIMED data product will be a valuable resource for the oceanographic and modelling communities working in the Mediterranean Sea, contributing to improved risk assessments and supporting future adaptation and mitigation strategies in the context of global change. Our detailed responses to the comments are provided below.

Questions and suggestions:

This work focuses on carbon and transient tracer cruises and data, with nutrients as ancillary parameters. While it mentions regionally-focused data products for nutrients in the Western MedSea, it would be nice to get an impression of how many more cruises there would be (than the current 46), if the data collection would relax its carbon/transient tracer requirement and include all MedSea cruises with high quality nutrient data? I guess this can only be done as an order of magnitude estimate for the entire Mediterranean at this point. But it may be helpful, to illustrate the potential and to kindle motivation of the same/other researchers to next target such an expanded, stronger nutrient-focused FAIR MedSea dataset?

Several initiatives mentioned in the Introduction have developed biogeochemical data products for the Mediterranean Sea. These products not only compile and disseminate biogeochemical data in accordance with FAIR principles—such as dissolved inorganic nutrients (Belgacem et al., 2020, , <https://essd.copernicus.org/articles/12/1985/2020/essd-12-1985-2020.html>) and dissolved oxygen from CTD sensors (Belgacem et al., 2025, <https://essd.copernicus.org/articles/17/5315/2025/essd-17-5315-2025.html>)—but, importantly, they also make a substantial effort toward data harmonization and quality control. This constitutes a key added value of CARIMED, in line with other data products in the Mediterranean Sea. Additional examples focused on the CO₂ system are provided by Jiang et al. (2026, <https://essd.copernicus.org/articles/18/1405/2026/>).

Regarding the question of how many additional cruises with biogeochemical data could contribute to such data products, we note the existence of the EMODnet Chemistry aggregated datasets for the Mediterranean Sea, particularly those addressing eutrophication. These datasets include 206,650 samples from 2,036 cruises spanning the period from August 1911 to July 2024 (HCMR/HNODC and OGS, 2025).

*Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC), National Institute of Oceanography and Applied Geophysics - OGS, Division of Oceanography. Mediterranean Sea - Eutrophication and Acidity aggregated datasets 1911/2024 v2025.
<https://doi.org/10.13120/13d2a552-ee18-49a0-abdf-ac7936bc070f>*

A major challenge, however, lies in assessing the level of harmonization and overall consistency of these aggregated datasets. EMODnet provides detailed documentation of its data management workflow and quality control procedures, aimed at producing standardized, harmonized, and validated regional data collections for eutrophication (nutrients, chlorophyll, and oxygen) and ocean acidity (pH) across European sea basins (Lipizer et al., 2026). These procedures are primarily based on statistical evaluations of nutrient concentration ranges within the regions defined by Manca et al. (2004), with out-of-range values being flagged.

Lipizer M., Molina Jack M. E., Wesslander K., Fyrberg L., Tsompanou M., Iona A., Buga L., Sarbu G., Gatti J., Larsen M. M., Østrem A. K., Giorgetti A. 2026 Guidelines for eutrophication data aggregation, harmonisation and Quality Control. Version 3. Pp. 45, doi: 10.13120/8XM0-5M67

Extending such approaches to ensure full consistency across datasets spanning more than a century (1911–2024) would represent a substantial effort, particularly if more advanced secondary quality control (2QC) procedures were to be applied.

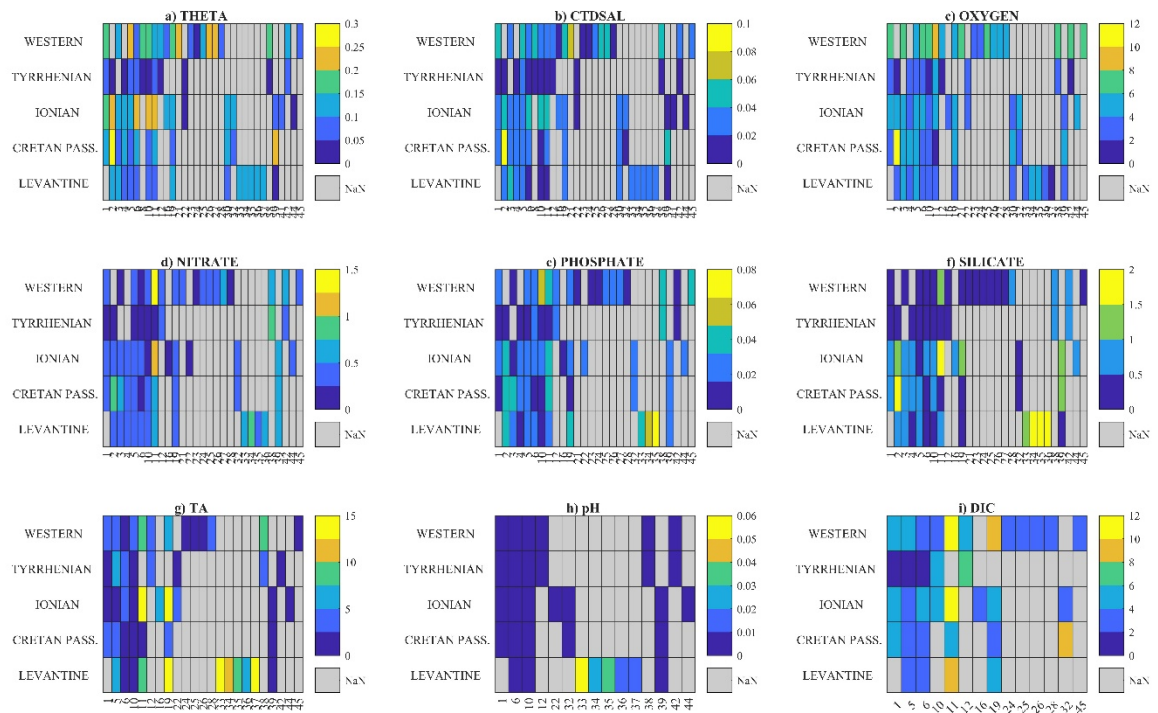
We have added a phrase about EMODnet Mediterranean Sea Eutrophication and acidity aggregated dataset in the introduction section. The text now reads as: [Complementary regional efforts include the aggregated data regarding eutrophication \(inorganic nutrients, dissolved oxygen, chlorophyll and acidity accomplished by EMODnet Chemistry \(2025\) with specific quality control procedures tailored for the Mediterranean Sea \(Liziper et al., 2026\) but no specific bias detection and correction procedures. In contrast the data products DIN-WMED for dissolved inorganic nutrients \(Belgacem et al., 2019, 2021\) and CTDO2-WMED for dissolved oxygen in the western Mediterranean Sea \(Belgacem et al., 2025a, b\), developed procedures to detect and finally apply adjustments to the aggregated data, and further highlight the value of basin-specific synthesis products tailored to regions with strong temporal and spatial variability.](#)

I feel that a few key figures have been placed in the supplemental materials. While one can easily get overwhelmed by the number of figures that come out of such an analysis, I suggest the authors go through the supplemental material and check whether they (visually) support key aspects of the work and approach, and should rather move some of them to the main manuscript instead. Views may differ on which of them are "key", but, e.g., I would have thought a version of Fig. S8 on the intra-cruise homogeneity across depth/time as one such key figure, relevant to get readers of the main manuscript an idea of the reliability of the data products across depth/time.

We appreciate the referee's comment and have carefully reviewed the manuscript and the supplementary tables and figures. We prefer to maintain the current distribution of figures to preserve a simple and clear readability of the main manuscript. Introducing Fig. S8 into the main text, which shows the standard deviation of the original physical and biogeochemical data for each cruise in the tracer minimum zone (layer with the lowest temporal variability), would also require presenting the results after bias adjustment for the sake of coherence. Including both would make the main manuscript overly complex. For this reason, we have decided to keep Fig. S8 in the supplementary material, retain Table 2 in the main manuscript, and present Fig. 3 showing the overall CARIMED homogeneity before and after the bias adjustments.

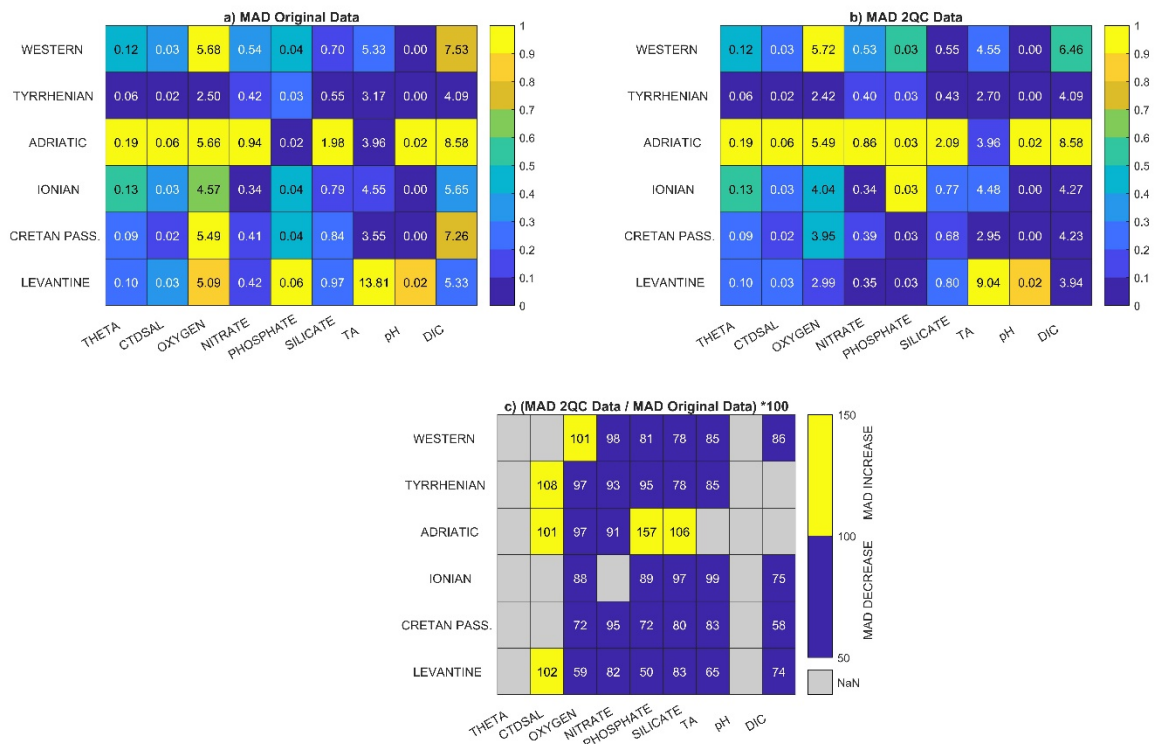
For the main manuscript, Fig. S8 should be re-worked by (1) using a colormap with a number of discrete rather than continuous color shading, which typically helps to better make out the data magnitude, and (2) using a less intense color for NaN (e.g., light grey instead of black) to focus the eye on the data rather than on the gaps.

Thanks for the suggestion. We hope the figure now looks clearer.



The same holds for Figure 3.

Thanks for the suggestion. We hope the figure now looks clearer.



Aspect to improve:

- Fig. 1 / early section 2: In most of the text you refer to two synthesis products whereas in figure 1 you talk about three complementary outputs of your work. Maybe this can be harmonized a little more (whether you created two or three data outcomes?).

Thanks for the suggestion. We have now changed Figure 1 and instead of products we use the word outcomes, indeed we release two data products (aggregated original and synthesis bias-adjusted products), and in addition we think the individual original cruise data and metadata in [CARIMED NCEI-OCADS](#) within the [CARIMED Cruise Summary Table and Original Cruise data](#) is a useful outcome.

Minor items:

- I.151: check sentence. *Thanks for the suggestion. The phrase now reads: [When available, additional information on analytical methods and measurement QC was collected, with comprehensive cruise reports proving particularly valuable information.](#)*

- I.268: check sentence. *Thanks for the suggestion. The phrase now reads: [More recently, the Med-SHIP program has promoted repetition every 5–6 years of North–South hydrographic lines in each MedSea sub-basin, with TALPRO and CRELEV cruises in 2016 \(Schroeder et al., 2024\) serving as reference occupations.](#)*

- I.425: check sentence. *Thanks for the suggestion. The phrase now reads: [For the western Mediterranean Basin, crossovers were performed for waters at depths between 600 m and 2,000 m.](#)*

- I.637-640: paragraph can be removed, because repeated at least the fourth time here. *Thanks for the suggestion. Indeed, it is repeated in the DATA AVAILABILITY section.*

- I.676: LINK. *Thanks for the suggestion. Added.*
<https://www.ncei.noaa.gov/data/oceans/ncei/ocads/metadata/0309255.html>

Citation: <https://doi.org/10.5194/essd-2025-759-RC3>