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Comment on essd-2021-149

Anonymous Referee #2

Referee comment on "Climatological distribution of dissolved inorganic nutrients in the western Mediterranean Sea (1981–2017)" by Malek Belgacem et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-149-RC2, 2021

This is a well-written, high-quality manuscript providing a significant long-term climatological dataset for the biogeochemical parameters, their spatio-temporal change and the processes involved in the Western Mediterranean. The data product is based on in-situ observations from various cruises over the period 1981 – 2017.

- The abstract is informative, although I would like to see 1-2 statements on data quality, on the comparison with previous datasets and the overall value of this data product.
- In Introduction, lines 31-32, I believe upwelling is not relevant in the context of this sentence.
- In Introduction, the main physicochemical processes and circulation affecting the distribution of nutrients in the WMED is shown. However, the role of rivers supplying nutrients in the EMED and WMED is not discussed. Please add a paragraph discussing the main riverine fluxes of nutrients, mostly from the Nile, Rhone, Po and Ebro, and their trends in the various basins and sub-basins.
- Table 1 illustrates the existing two nutrient climatologies for the WMED. The Table is informative and well-structured; it is unclear however, if the present work contains also the data of the past climatologies. Please explain. Also, the WOA18 contains only bottle data, while you imply to also use data from argo-floats. It is unclear what are the percentages between bottle data and data from Argos. Finally, please provide the units used to report the nutrient data per climatology.
- One deficiency of the database built is the gap in observations between 1997 and 2003. Although mentioned and presented graphically in Figure 2a, it is not very clear how authors deal with this gap in their analysis.
- Another deficiency is the bias towards summer period. Again, it is not very clear how mean-annual fields are produced from these biased data. The statement "Adjustments were applied to measurements when bias was detected" should be further elaborated.
- Authors do not report the analytical methods followed for nutrient analysis, per database used. Perhaps a Table including the analytical techniques and instrumentation used will be useful.
- For the data quality check, perhaps a flow chart will guide the readers on the step-by-step procedures followed. In WOA18, other checks are also followed, like the Range and Gradient Check and the Representativeness of the data check. It is unclear if QA/QC

followed here is the same as the compared climatologies.

- In Eq (1) the term (μi) in the observational constraint term is not explained. What is its range and how it is evaluated. Similarly, although known, it is better to describe the φ(xi, yi)-term.
- Authors state that they applied the fourth-dimensional DIVAnd method. What is DIVA's response when there are gaps in time as in this dataset. Perhaps analysis should be divided in two periods, prior and after the period lagging data, and apply DIVA in each separate dataset.
- Also, please explain if DIVA was used to extrapolate data in areas with data gaps and towards the coast?
- Line 261. For which parameter do these values refer? for which depth?
- Lines 277 – 279. Probably here you refer to the horizontal Lc variability. How do you comment on the lower values of Lc for silicates compared to nitrate and phosphate?
- Lines 280 – 288. Text is mixing the diagrams and Lc-parameter from horizontal to vertical. Better write one paragraph describing the horizontal and another for the vertical Lc.
- Line 330. "A score is assigned to each observation". Please elaborate on the score assigned per observation. What is the score range and the increments used on the scaled error.
- Figure 6. Please explain the dashed blue line.
- Lines 389-391. You should also refer to the rivers supplying nutrients to each area. The e-HYPE database from SMHI could be helpful to assess the riverine fluxes of nutrients.
- Since nitrate is the dominant N-species in the WMED, authors could produce the stoichiometric N:P:Si ratios and discuss their mean and standard deviation values per sub-area and for the whole WMED.
- Line 506. Please consider that medBFM assimilates satellite and argo data and includes terrestrial inputs of N and P from 39 rivers.
- Lines 516 – 522. If I understand well, you re-gridded the BGC-WMED from 0.25 deg to 1 deg, to compare with WOA18 and the medBFM fro, 0.063 deg to 0.25 deg to compare with NGC-WMED. Please explain better this process.
- Lines 542-543. Could the largest difference seen in the Alboran Sea be attributed to the occurrence of more frequent upwelling events during the WOA18 period?
- Line 761-762. This is a valid point you are making on the decline of river discharge. What abou the nutrient fluxes over this period?