

Ocean Sci. Discuss., referee comment RC2
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Comment on os-2021-68

Anonymous Referee #2

Referee comment on "Characterization of the Atlantic Water and Levantine Intermediate Water in the Mediterranean Sea using 20 years of Argo data" by Giusy Fedele et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-68-RC2>, 2021

My Overall Recommendation

Moderate revision

General comments

I have reviewed the manuscript by Fedele et al., entitled "Characterization of the Atlantic Water and Levantine Intermediate Water in the Mediterranean Sea using Argo Float Data.

This study examines long-term Argo float datasets of ocean temperature and salinity to characterize the temporal trends and the spatial variability of the AW and LIW in eight climatic sub-basins of the Mediterranean Sea. It should be highlighted that AW and LIW have been referred to be important drivers of the internal variability of the Mediterranean thermohaline circulation. Authors found a clear salinification and warming trends of the AW and LIW: AW becomes saltier (except in the Algerian, Catalan and Ligurian sub-basins), warmer (except in Cretan sub-basin), while the LIW becomes saltier (particularly in the Adriatic), warmer (except in the Cretan and Levantine sub-basins).

The manuscript is well written and the illustrations are clear, although some figure captions can be improved. In addition, the authors provide a comprehensive and helpful review of previous results involving the characterization of the AW and LIW, without entering in detail to analyze other methodological approaches. Causes behind the AW and LIW salinity trends need to be addressed in detail.

For these reasons, I would strongly encourage authors to resubmit their manuscript after carefully considering the following moderate comments that will, hopefully, improve the quality of the manuscript before consideration of publication:

Specific Comments

- Title could better reflect the content of the paper: Please, consider revising it to highlight the use of 20 years of data from the last decades since the use of long-term timeseries constitutes, from my viewpoint, the main strength of this work to determine trends, which have often been based of very few data)
 - Suggestion 1: Characterization of the Atlantic Water and Levantine Intermediate Water in the Mediterranean Sea using last two decades of Argo Float Data
 - Suggestion 2: Characterization of the Atlantic Water and Levantine Intermediate Water in the Mediterranean Sea using last 20 years of Argo Float Data
- Authors are requested to explain how this approach, based on min/max salinity peaks, is considering the positive trend due to climate change for tracking the AW and LIW. The use of geometry-based method is recommended to better detect the water masses instead of the traditional criterion based on predefined temperature and salinity ranges, as concluded by Juza et al., 2019; Vargas-Yáñez et al., 2020). In addition, they mentioned that the use of pre-determined temperature and salinity ranges does not allow to detect and track spatio-temporal changes in water mass properties and may lead to erroneous characterizations and interpretations.
- Authors are asked to justify the use of the minimum difference value of 0.01 for the definition of the peak.
- Authors are invited to provide an explanation about the effect of the lower percentages of effective profiles related to the total number in Levantine (for AW and LIW) and in the Adriatic (for LIW) in the final results.
- Authors are requested to further explain how the exclusion of profiles where no peaks were found (due to intense vertical mixing) could interfere in the interpretation about the stratification trend.
- Did you exclude lower salinity in the Cretan sub-basin (i.e. where the highest salinity of LIW was found)?
- Authors are encouraged to double-check their conclusions, which seems to be in contradiction with the main results found: e.g. as it states in the results and Fig 2, LIW becomes saltier (particularly in the Adriatic) and warmer (except in the Cretan and Levantine sub-basins), but the conclusion (L-487) states that LIW is less salty (i.e. fresher), and colder.
- It may also be worth further investigation about the drivers of the AW and LIW interbasin and interannual variability in the context of this study.
- As a general comment regarding the in-text citation and reference list order:
 - please consider to review the in-text citation order, listing the sources alphabetically by author surname (APA reference) or using author-date referencing, ordering the citation based on data of publication.
 - please, consider to review the reference list, to arrange entries in the alphabetical order by the surname of the fist author (e.g. incorrect order found in L555 before L558; L571 after L565; L625 before L629, etc.).

Technical corrections

L-56: specify the different approaches for identifying AW and LIW and the advantage of the methodology used in this study by means of the identification of min and max values, particularly for the characterization of the AW (i.e. much more influenced by other forcings)

L-56: add references of different approaches (e.g. Juza et al., 2019; Vázquez-Yañez et al., 2020)

L-65: add references about the hydrological properties of AW (as the authors properly do for the LIW in L-77)

L-84: add additional recent studies including, for example, Juza et al., 2019; Vázquez-Yañez et al., 2020

L-143: add one paragraph about the new initiatives of deploying floats in shallow coastal areas (e.g. off the North Adriatic coast and off the Bulgarian Black Sea). Authors can access to the tracks in this link: <https://www.euro-argo.eu/EU-Projects/Euro-Argo-RISE-2019-2022/Access-to-Euro-Argo-RISE-Data>

L-151: please, add the URL to access the float monitoring and data (<https://fleetmonitoring.euro-argo.eu/dashboard?Status=Active>)

L-235: please, add eight Mediterranean "climatic" regions

L-345: authors are encouraged to justify the main reasons of the contradiction found with the results provided by Millot (2007), is it just a matter of the period selected?

L-345: do you mean Mediterranean "outflow"?

L-365: authors are encouraged to further explain the agreement found with Schuckmann et al., (2019) about the SST warming (0.018 versus 0.04 °C/yr., it is more than twice)

L-469: please, consider to replace non-stationary with "variable".

Fig.1: please, increase resolution of the image. The use of different colors for different sub-basins might help.

Fig.3-8: authors are invited to include the trends/yr. included in Table 1 in each one of the subplots, to better identify higher/lower trends in the figures.

Fig.5 and 8: in order to help in the interpretation of the results at a first glance, please include the following in the caption of the figures. "Positive/negative trends (red/blue squares) in this case corresponds to an increase/decrease of the depth (i.e. deeper/shallower)"