

General comments :

This document describes the 3D ocean current dataset developed in the framework of the World Ocean Circulation project (ESA funded) and named WOC-NATL3D.

The dataset extends over the North Atlantic, from the surface to 1500 m depth at a 1/10° spatial resolution on a daily basis. The dataset contains horizontal and vertical velocity, as well as temperature and salinity fields from 2010 to 2019.

A deep learning algorithm is used to compute 3D T/S fields which then feed a diabatic quasi-geostrophic equation together with ERA5 fluxes and horizontal Ekman currents estimates from European Copernicus Marine Service.

This product has been developed to fit the purpose of fishery applications that need higher spatial resolution vertical velocity.

This article is well written, pleasant to read and well structured. However, we are still left wanting more information about validation. It does not clearly answer the question of the validity of the WOC-NATL3D vertical velocity:

- Some figures request more discussion in the text. The authors referred to publications describing the method, but more details could have been provided in the text for a better comprehension.
- All the validation is performed on current intensity. There is no indication on the validation of direction of the current, neither on WOC-NATL3D nor the other reanalysis dataset. Vertical velocity is related to divergence of the horizontal flow but no validation of the zonal nor meridional component is shown here. Can the authors provide some justification for this choice or provide some more validation results?

Specific comments:

1. **Lines 30 to 35:** *“in order to obtain high spatial resolution (mesoscale-resolving) estimates of the 3D currents (including its vertical component), to be used for specific case studies.”*

The only mention of case studies in this document is between **lines 45 and 48**, referring to Munk et al, 2023 publication. Can the authors say few words about this, even if this is not the main purpose of this article?

2. **Lines 57 to 58:** *“It covers a wide part of the North Atlantic basin and spans from 2010 to 2019.”*

Can the authors say a few works to justify the choice of this time period?

3. **Line 81:** How is OSTIA dataset subsampled? Is it one point out of 2?
4. **Lines 83 to 89:** Can you add a reference to *“the multidimensional optimal interpolation algorithm used within the Copernicus Marine Service to retrieve the global SSS product”*?
5. **Lines 90 to 95:** Can you make a comment on the temporal resolution/ temporal smoothing resulting from the ± 10 days temporal window used to select the insitu profiles in the ADT estimation?
6. **Lines 100 to 104:** I understand that the 3D climatology is vertically interpolated on regular 10m vertical levels. It does not match the WOC-NATL3D vertical grid (unregular spaced vertical grid). Can you provide more details?

7. **2.1.3:** about the Ekman product reference, the last reference is Mulet et al, 2021 (but based on Rio et al, 2014):

Mulet, S., Rio, M.-H., Etienne, H., Artana, C., Cancet, M., Dibarboure, G., Feng, H., Husson, R., Picot, N., Provost, C., and Strub, P. T.: The new CNES-CLS18 global mean dynamic topography, *Ocean Sci.*, 17, 789–808, <https://doi.org/10.5194/os-17-789-2021>, 2021.

In the following, it seems that you only use the Ekman current from the daily MULTIOBS_GLO_PHY_REP_015_004 product (which is the sum of geostrophy+ Ekman). Can you just say a few words on how you recover the “Ekman only” component?

8. **2.1.1 to 2.1.3:** can you say a few words on why you choose a cubic spline interpolation for the different input datasets?
9. **2.2.2:** can you precise the frequency of the YoMaHa database? I think you don't use the surface YoMaHa observations in the following. Can you explain why?
10. **Lines 203 to 205:** can the authors provide some details on the dynamical inconsistencies between OMEGA3D and WOC-NATL3D and why this formulation provide a correction?
11. **3.1.** why do you choose 100 m and 1000 m levels to show SODA and WOC-NATL3D vertical velocities? Is it a good think to find more intense vertical velocity than SODA?
12. **Lines 232 to 235 on Figure 2:** we can see some spike in WOC-NATL3D statistics (Gibraltar and lower left corner) on both bias and RMSD. Can you explain? Do you apply a threshold on the minimum number of matchup into bins to compute statistics?
13. **Figure 3:** you have to qualify results of Figure 3. Because, one result is that WOC-NATL3D is closer to DUACS than to GLORYS. Is it expected as DUACS is supposed to be “only” a geostrophic current? I suppose RMSD are the same as in Figure 2, computed after a 5-days averaging (smoother data indeed.) That's only part of the signal spectrum, and this is probably why, surprisingly, DUACS better matches the drifters than GLORYS. I think, results from Figure 1 and Figure 2 need a deeper analysis and comment in **§3.2**.
14. **Lines 246 to 257: Figure 4 and 15m statistics:** it could be interesting to also add DUACS in the 15m comparison. Can you explain why bias and RMSD are lower at 15m compared to the surface? It could have been interesting to provide statistics on zonal and meridional components separately to assess the Ekman spiral from the surface to 15m depth.
15. **Lines 258 to 270:** validation at 1000m depth. Can you provide the mean bias value of SODA? From **Figure 6**, it seems that SODA provide the lower RMSD and bias of the 3 simulations. This is not commented here. Can you complete this analysis?
16. **Lines 284 to 285:** once again, the authors only discussed on current intensity. So, can it be relevant for vertical velocity assessment?
17. **3.3 Spectral analysis:** conclusion of this section is that the effective resolution of WOC-NATL3D in the Gulf Stream area is near $\frac{1}{4}^\circ$. Can you further comment this result? Is it enough to fit the purpose of the project and the user cases?
18. **Conclusion: Lines 328 to 330:** Can the authors say some few words about the differences between background and retrieved horizontal ageostrophic velocity? Here again, validation diagnostics on zonal/meridional components would have been useful for the discussion.

Technical comments:

Repetition of word “computed” in Figure A1 caption.