

## **Review of “3D reconstruction of horizontal and vertical quasi-geostrophic currents in the North Atlantic Ocean” by Sarah Asdar, Daniele Ciani , and Bruno Buongiorno Nardelli**

The authors present a  $1/10^\circ$  data-driven data set of 3D ocean currents, as well as of temperature and salinity in the upper 1500 meters of the North Atlantic subtropical gyre between  $20^\circ\text{N}$  and  $50^\circ\text{N}$ , WOC-NATL3D. The data set covers the period from 2010 to 2019 with daily resolution.

The product is based on a diagnostic tool originally developed for a global product (OMEGA3D) by Bruno Buongiorno Nardelli (2022). The method is based on the the quasi-geostrophic omega equation. A deep learning technique is used to obtain the fields from Argo profiles, altimetry, SST and SSS. Also used are ERA5 air-sea fluxes and modelled Ekman currents from Copernicus.

Both products, WOC-NATL3D and OMEGA3D, are supposed to better reproduce drifter observations when compared to reanalysis products. WOC-NATL3D aims to improve accuracy near the surface, in particular by using the modelled Ekman currents. Two reanalysis products (SODA and GLORYS) as well as drifter and altimetry data are used for evaluation.

The article is written well and comprehensibly and also well structured.

Comments:

- Evaluation of the vertical velocities (section 3.1) is quite limited. I find it understandable that no comparisons with direct measurements are possible. However, an estimation of the uncertainty of the vertical velocities is desirable.
- I understand that the SODA data set was selected for comparison because vertical velocities are rare in reanalysis products. With GLORYS a second reanalysis product was selected for comparison, is there a justification for this choice?
- The labels and titles of the figures are in a small font size. The subscript letters in the titles in particular are difficult to read on a printout.

l 15 “On the other way round”, I would remove this

l 108 the surface latent and “sensible” heat flux ?

l 179 I can’t find an explanation of the meaning of the variable  $\gamma_\rho$  in Eqn. 2

l 182 I can't find in which equation the variable  $v_\rho$  is used

l 185 I would start a new paragraph, before “In order to further improve ...”, as the following text focuses on extensions of OMEGA3D

l 218 “... likely due ...”, can this be explained further ?

Figs. A1, B1, C1 “computed computed” in the caption