

Earth Syst. Sci. Data Discuss., referee comment RC2  
<https://doi.org/10.5194/essd-2022-111-RC2>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on **essd-2022-111**

Anonymous Referee #2

---

Referee comment on "Sea surface height anomaly and geostrophic current velocity from altimetry measurements over the Arctic Ocean (2011-2020)" by Francesca Doglioni et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-111-RC2>, 2022

---

In this work, the authors assess a new Arctic-wide gridded dataset of sea surface height and geostrophic velocity at monthly resolution during the period 2011 to 2020. This dataset was generated using Cryosat-2 observations from two products (RADS and AWI). The authors describe how the gridded altimetry-derived variables are produced and show results from comparisons against available in situ measurements (moorings) and an independent state-of-the-art data (altimetry). The seasonal cycle emerging from the final monthly maps is finally discussed.

Overall the paper is certainly of interest to the Arctic community. There is a need to have a unified data set for the ice-covered region and for the ice-free region that is validated properly. The authors provide a description of RADS and AWI products as well as how the two products are made consistent and homogenous before gridding. The new gridded data set is validated, but only in the Fram Strait and Laptev Sea.

Overall the paper is well written with a clear rationale. My feeling is that the processing and validation part is rather limited. Altimeter data retrieval in the ice-covered region is very challenging due to presence of ice that perturbs radar echoes. It is stated that AWI product takes care using a customized processing. The reader expects more convincing analyses of RADS and AWI before their merging, with some statistics about their quality in the whole Arctic area. Authors only show one profile at certain date (Figure 3) that cannot be representative of a ten year period.

I have also a remark about the velocity geostrophic computation at the surface. It is well known altimetry data are noisy and the accuracy of the slope estimate from along-track SLA is strongly impacted. It might dominate the errors in estimating ocean currents because a simple finite-difference of the along-track SLA acts as a high-pass filter. This effect can be mitigated, see Liu, Y., Weisberg, R.H., Vignudelli, S., Roblou, L. and Merz, C.R., 2012. Comparison of the X-TRACK altimetry estimated currents with moored ADCP and HF radar observations on the West Florida Shelf. *Advances in Space Research*, 50(8),

pp.1085-1098.

Also, the direct comparison of the altimeter-derived geostrophic current velocities with the mooring real current velocities does not account for a wind-driven Ekman velocity component. Why ? is the wind contribution supposed negligible ?

Having said that, I think the paper deserves publication after the authors reinforce the statistics of the two data sources (AWI and RADS) that are used to generate the new data set. If possible I also recommend to extend the validation to other sites in order to provide the reader with a more complete picture about the accuracy of the altimeter-derived sea level and velocities against in situ measurements.