Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on essd-2021-103

Anonymous Referee #2

Referee comment on "North SEAL: a new dataset of sea level changes in the North Sea from satellite altimetry" by Denise Dettmering et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-103-RC2, 2021

In this manuscript from Dettmering et al. a new sea level dataset from satellite altimetry in the North Sea is presented and extensively compared with other satellite altimetry datasets and with tide gauge observations. It is difficult to compare absolute sea level from altimetry to relative sea level as measured from tide gauges but the authors make a meaningful comparison by using GNSS data, two GIA models and the contemporary mass redistribution. I particularly appreciate the focus on the linear trend over the full time series which is a very relevant societal indicator. I am convinced by the case made by the authors that this new data set improves on previous ones. In any case by comparing three different datasets this manuscript helps to reveal the uncertainties from satellite altimetry measurement in the North Sea which is already an important result. Therefore my suggestion to the editor is to publish this work after the following minor revisions:

- The influence of wind on sea level in the North Sea is large because it is shallow (Dangendorf et al. 2014). Most of the monthly time scale sea level variability is wind driven. Therefore I am surprised that there is no more discussion of the Dynamic Atmospheric Correction. Is the DAC-correction here the same as for the other two altimetry products? Why use a DAC based on atmospheric analysis? Using a DAC based on the ERA-interim reanalysis showed an improvement (Carrère et al. 2016) and ERA5 would improve further.

- I am curious if there are plans to keep this dataset up to date in the future. That could be mentioned somewhere.

- I strongly advise the authors to also share the code used to make the analysis in this manuscript. Especially since NorthSeal is not on a standard rectilinear grid the use of the data by other people would be greatly simplified with an example.

- l.292: It is interesting to compare with Wahl et al. 2013. As additional potential source of discrepancy you could also mention that their region was different, it extended further into the Channel and they found much smaller trend in the Channel (1.32 +-1.11) than in the inner North Sea (4.59 +-1.82). And the GIA uncertainty is also large.

Carrere, Loren, Yannice Faugère, and Michaël Ablain. “Major Improvement of Altimetry

Sea Level Estimations Using Pressure-Derived Corrections Based on ERA-Interim Atmospheric Reanalysis." Ocean Science 12, no. 3 (June 27, 2016): 825–42. https://doi.org/10.5194/os-12-825-2016.

Dangendorf, Sönke, Thomas Wahl, Enno Nilson, Birgit Klein, and Jürgen Jensen. "A New Atmospheric Proxy for Sea Level Variability in the Southeastern North Sea: Observations and Future Ensemble Projections." Climate Dynamics 43, no. 1–2 (July 2014): 447–67. https://doi.org/10.1007/s00382-013-1932-4.