



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-354-RC2>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## **Comment on egusphere-2022-354**

Anonymous Referee #2

---

Referee comment on "Interannual to decadal sea level variability in the subpolar North Atlantic: the role of propagating signals" by Denis L. Volkov et al., EGU sphere,  
<https://doi.org/10.5194/egusphere-2022-354-RC2>, 2022

---

The subpolar North Atlantic is a key region for climate variability both over ocean and land. Using sea-surface heights and hydrography, this study by Volkov and colleagues adds new insights regarding the processes driving the interannual-to-decadal variability in the region. This is important in order not to generalize the processes, as typically done, dominating the characteristic time intervals during the altimetry period. The paper is well-written and the analysis are clear and straightforward but there are some elements that need improvement, and I am still missing the big picture of the presented results. I include some comments to help revising the paper before it can be recommended for publication.

### Comments

- The introduction presents the AMOC and North Atlantic gyres, and how they have varied over time, but the results in the paper do not connect back to these circulations. To give one example: what is the state of these circulations during the identified characteristic time intervals? A discussion section may be required to put the results in the paper in an AMOC and gyre context. The authors should also explore the possibility of using the observed AMOC time series to do so.
- The reader is also minimally provided with the implications of the results. Adding this may be easier after reconnecting the presented results to changes in the North Atlantic circulation (comment above).
- The CEOF analysis applied to the SSH is technically straightforward to understand. But, what does this signal propagation tells us about the two-way coupling or communication between the two gyres during its evolution? And can this mainly be attributed to advection?
- While the CEOF analysis applied to oceanic variables is "easy" to grasp, this is not the case for atmospheric variables and on long time scales (there is no such predictability in the atmosphere, is there?). Because of this, I am really struggling in interpreting the results presented in Fig. 11.

## Minor comments

- Why does EOF2 show a strong signal on the shelves?
- 260: How different is the variability of the SSH between the Iceland and Rockall Basins as compared to that of the Irminger Sea?
- 315: What is the reason for the 10-month lag?
- 325: Can the authors quantify the Ekman-induced SSH anomalies?
- Figure 11: reversing the colormap is confusing.
- Figure 12: please add more details to the caption.
- Please assess and add significance to the regression figures throughout.
- Please improve the text whenever possible. It is hard to follow at multiple places in the results, especially when describing the results in the context of previous work. A discussion section would have helped to avoid this.