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Ocean Science
Discussions

Interactive comment on "Global sea level reconstruction for 1900–2015 reveals regional variability in ocean dynamics and an unprecedented long weakening in the Gulf Stream flow since the 1990s" *by* Tal Ezer and Sonke Dangendorf

Anonymous Referee #4

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The 'Global sea level reconstruction for 1900–2015 reveals regional variability in ocean dynamics and an unprecedented long weakening in the Gulf Stream flow since the 1990s' by Ezer and Dangendorf analyzes and discuss the applicability of the global sea level reconstruction for regional studies of ocean dynamics. Despite the relatively coarse resolution of the reconstruction the authors show that low frequency variability is well correlated with coastal sea level and the upper mid ocean transport of the RAPID observations. The authors show that recent transport variations in the Gulf Stream are

represented in the reconstruction and are consistent with findings of other studies.

The claim at the end of the abstract, that the reconstruction is useful for studies of long-term variability in other regions has a good perspective to become true when the reconstruction is analyzed with respect to dynamics and climatic change in other regions. The paper is an important and useful contribution by evaluating the potential of the global sea level reconstruction of Dangendorf et al., 2019. I would recommend publication in Ocean Science after minor revisions.

General comments:

The analysis focuses on the low frequency modes of sea level differences in the Mid-Atlantic Bight but summarizes the findings in terms of periods of sea level rise acceleration. There could be more support for the claim of sea level rise acceleration with a trend analysis instead of a frequency analysis.

Specific comments:

The region defined to calculate the GS-MAB proxy does not include some of the strongest signals shown in the maps in Fig. 1. It would be useful for the reader to have some sort of statement about the sensitivity of the conclusions from Section 3.1 on the definition of the GS-MAB region.

The caption of Fig. 1 suggests that the sea level differences between individual years are shown. The text describing Fig. 1 does not specify details. As the authors point out, the interannual variability (Fig. 2) in the southwestern North Atlantic is high and the maps in Fig. 1 might not be representative for sea level rise in the 20-year periods shown. Maybe a form of average sea level rise during the different 20-year periods would be more appropriate?

I appreciate the placement of the findings into the larger picture in paragraph from l179 to l206. It is on the other hand more like a discussion of the results and the authors might consider to move this part to Section 4.

Fig. 8d and Fig. 9a show a somewhat different correlation between the GS-MAB proxy and the FC transport. It would be interesting to discuss whether this difference is related to the lengths of the time series or to other factors.

l378: long-term variations in regional dynamics can be captured quite well by this global reconstruction, therefore providing a useful tool for studies of long-term past variability in other regions as well.

This statement is probably true, but it has to be shown in the future.

Technical details:

l71: summary

l102: large acceleration (increase?) in flooding

l134: mode-1

l149: acceleration in global mean sea level (rise?) since the

l241: coarse resolution

l261: mode 1

Fig. 5a: trend removed

Fig. 8: sea level change across the GS (in cm per 1 latitude)

Fig. 10: (Sv)

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