Response to anonymous Referee #1

The referee is thanked for the positive comments and many useful suggestions that helped to improve the manuscript. All the comments were addressed as detailed below.

The main changes in the revised manuscript include:

1. New Fig. 1 that compares the mean SSH of RecSL with AVISO and shows the locations of data and subregions.

2. Reorganization of the entire manuscript, so that validation/evaluation of the reconstruction against data comes first (new section 3.2) and precedes the discussion of mechanisms and basin-scale modes (new section (3.3).

3. Seven new references (4 of which were suggested by the reviewer) were added.

Note: because of the reorganization of the paper, track-changes would be too messy, so instead here is the summary of the changes:
Figures: 1 (new fig.), 2 (prev. #1), 3 (#2), 4-6 (#5-7), 7-8 (#9-10), 9 (#3), 10 (#4), 11 (#8)
Sections: 1-2 (same as previous sections)

- 3.1. Regional and global sea level rise (previous: Sea level and Gulf Stream)
- 3.2. Comparison of the reconstruction with recent data (prev: Comparison & proxy GS)
  - 3.2.1 Coastal sea level
  - 3.2.2 The Florida Current
- 3.3. Potential driving mechanisms for decadal variability in the RecSL
  - 3.3.1 The Atlantic Multi-decadal Oscillation (AMO)
  - 3.3.2 Atlantic Meridional Overturning Circulation (AMOC)
- 4. Summary and conclusions (same as previous section)

Response to specific comments:

4. Ref#1: *I think it's a great idea to analyse this dataset for these purposes. I found some of the validation very compelling and some unfulfilling. I thought the coastal sea level section was under-explored.*
Response: Thanks for the positive comment. We further explore the sea level in a new separate section (3.2.1), but also indicate that extensive validation of SL was already done in Dangendorf et al. (2019), see lines 112-117.

5. Ref#1: *I found the structure confusing and suggest it could be rearranged so that validation is interactive separate from the deeper investigation and implications. This does require major work but, with this, the paper will make an interesting contribution to the literature.*
Response: This is an excellent idea that makes a lot of sense, so the manuscript was reorganized accordingly (see #2 above).

6. Ref#1: *I found the validation of the GS-SAB proxy very compelling (Fig 9b) but much less so the GS-MAB. The GS-MAB proxy as presented does not simply show strengthening/weakening*

and movement in the position of the GS or broadening of the GS is not considered. For the former, there are long datasets that could have been compared with e.g. Taylor et al. (1998) and Joyce et al. (2000). Better validation of this index and what it represents would make the conclusions more compelling.
Response: These two references were added, and we acknowledge that variations in the position of the GS and in broadening its front may also contribute to spatial changes in SLR. However, as explained now and shown in Fig. 1, the RecSL grid is too coarse (~100 km!) to resolve variations in the GS position or broadening, thus we can only analyze regional means here (lines 192-200).

7. Ref#1: *The link to coastal sea level could be investigated further. How may your findings be useful for coastal management? I thought the closer correspondence of the index to the coastal sea level at modes of lower variability could be very important. Bingham and Hughes (2009) presented the idea of 1 Sv : 2 cm. How does your reconstruction relate to this? Could this be indicative of differing ocean processes being important in communicating offshore sea level changes to the coast on different timescales?*
Response: The implications are discussed in the conclusions. Also, the Bingham & Hughes reference was added, with the comment that our results suggest somewhat similar relation, around 1Sv : 1.5 cm (lines 180-181, 268-271).
Structure: validation should precede the implications. **Done- see #2 & #5 above.**

8. Ref#1: *Minor comments:*
How would differing modes, not captured in the satellite era, impact the reconstruction?
Response: Very good question. It is explained now that multidecadal modes are not resolved by the satellite altimetry era, so low-frequency variations in the hybrid RecSL record are mostly derived from the tide gauge records through the Kalman Smoother, while altimeter data contributing mostly to interannual to decadal variability (lines 77-84, 211-214).

9. Ref#1: *l89-94, a map illustrating what you have done would be useful here. This would be beneficial to show the mean SSH from the reconstruction and to compare with the satellite ssh. This would give a better indication to the reader what has been used.*
Response: Following this suggestion, a new Fig. 1 compared mean SSH in the RecSL to satellite altimeter data and show the discussed subregions and the location of various observations used.

10. Ref#1: *l167-169, you haven't shown us the path of the Gulf Stream. This could simply be a northward shift of the current. There are many papers on the GSNW that discuss Interactive this mode of variability. Also, you need to consider whether the GS is weakening or broadening (Dong et al., 2019). The GS could be just as strong but not as narrow.*
Response: The reviewer is correct, but as explain above (point#6), the RecSL data is too coarse to detect shifts in the GS or changes in the width of the front- this kind of analysis had been done in previous cited studied using altimeter or section data which are better fit for that.

11. Ref#1: *l196-198, your reference list here is misleading. H&R (2004) showed a strengthening of the AMOC, Dong et al., only spoke of the GS. This could be a useful indicator but isn't investigated sufficiently accurately. Conflation of GS and AMOC.*
Response: This paragraph was rewritten (lines 300-313).

12. Ref#1: *l212-213, what method was used for calculating the degrees of freedom and correlation?*
Response: Detailed information with a new reference to the statistical method used (Thiebaux and Zwiers, 1984).) is now provided to explain how we estimate the degrees of freedom and confidence levels of correlations using EMD modes (lines 158-167).

Fig. 9 b. I find this a very compelling figure. **Thanks- this figure is now 7b.**

More updated references for RAPID should be considered: Smeed et al., 2018: **Added.**
Other suggested references that were added: Taylor & Stephens (1998), Joyce et al. (2000), Bingham et al. (2009).