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Accelerated sea level rise and Florida Current transport
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Responses to Referee #2

Thank you for your review and criticisms of the manuscript. In particular we feel that your suggestion to add of comparison of the various linear and nonlinear trends estimates in figure 2 significantly improves conveyance of the point that linear regressions over long periods of geophysical data may not be the best choice. Please find below the original comments followed individually by responses, and please note that all responses are indented.

Errata: Please note an error in the statistics of linear regression of transport onto time in the third paragraph of section 2. The standard errors were mis-reported. The changes are: 0.77 ±0.22 Sv to 0.77 ±0.55 Sv; 1.08 ±0.46 Sv to 1.08 ±0.11 Sv; and 0.57 ±0.38 Sv to 0.57±0.19 Sv. This does not change any of the arguments or conclusions of the analysis.

Regarding the EMD, some specific information about the different IMFs should be included and why 17 IMFs (+residuals) have been chosen? Here, an overview of the IMFs of the different datasets used (cable, ship, and tide gauge data) as figure or table would be helpful.

> We have added a table listing the span of temporal periods of the instantaneous frequencies of IMFs shown in the paper. Please note that the number of IMFs is not an explicit choice, but a result of the EMD algorithm. The EMD recursively extracts modes with the highest oscillatory frequencies until it is no longer able to do so. More complex signals require more modes.

Could it be that there is still some small long term variability left in the EMD residual of the timeseries of the cable data, with the timeseries not long enough for a full cycle?

> Yes, a partial cycle which is not fully expressed in the data record should be contained in the EMD residual. We note in the Abstract and Conclusion that it is not known whether the decadal decline we detect is part of a larger cycle or the anticipated decline in AMOC.

In addition, at least a short discussion on how the found 3Sv transport decline in the last decade is dependent on the method used (EMD) should be included.

> Thank you for this comment. We outlined some of this in the discussion on pg 555 line 22 – page 556 line 7. To address this we have moved discussion of the EMD to the Introduction, and expanded its content to better relate specifics of the EMD and its implementation.

As the cable transport estimates are related to absolute sea level, please provide an explanation how the connection is made to relative sea level measured by the tide gauge records, which also includes land movement, e. g. by GIA, sediment compaction, ...
How are effects from ocean tides and atmospheric pressure handled?

> Thank you for pointing out this lacking information. In response to Reviewer #1 we have presented analysis for the pressure corrections, and have updated the text to regarding subsidence and pressure as they relate to the tide gauge data and the multidecadal trends we analyze.

Page 555, line 10-11: Please provide a more detailed description of the reconstruction to fill large data gabs. And, how does the chosen gap filling method influence the linear and non-linear trends?

> Thank you for this comment. We have clarified the gap filling procedure in the text. In the linear case, there is effectively no difference when the missing data are not filled and are simply omitted. With the gaps filled the cable data linear regression over the entire period finds a decrease in transport of -1.08 +/- 0.11 Sv, while with no data reconstruction -1.05 +/- 0.11 Sv. This is not surprising given the large variance in the data and small linear trend. The EMD cannot ignore missing data, as it requires values for the recursive removal of modes.

page 559, line25: finding that the while → finding that while

> Corrected.

page 560, line 2: Please provide a definition of SD

> Corrected.

Page 560, line 14-26: This paragraph is quite confusing, maybe it is helpful to include a little table including the different trends and an indication about whether the seasonal cycle is removed. Maybe also include the trends of the linear regression.

> Thank you for this observation. We agree that the content is confusing, and have rewritten the section.

Figure 1: It would be good to show also the locations of the ship based measurements

> We have added the approximate location of the ship measurements.

Figure 2: As the scale is quite large in figure a and b, it would be useful to have an additional figure c including the EMD residuals of a and b. For comparison, maybe also the results of the linear regression could be included in figure c.

> Thank you very much for this suggestion. We have added the additional figure which compares the various trends, and feel that it helps to convey the essence of our argument that linear regressions are not ideal for trend analysis of multidimensional geophysical signals which have significant variance not due to random process noise. This new figure shows that from a linear perspective, there is little difference between the EMD residuals and linear regressions (if one were to perform a linear regression on a nonlinear trend). It also allows us to expand our discussion of this issue in the text.