

This manuscript describes the results of study that is a comparison of an ensemble of model re-analysis and recent observation based (XBT, mooring, satellite SSH) estimates of meridional overturn and heat transport across 34.5°S, the location of the SAMBA array. The paper is well organized and well-written and is worthy of publication. My main concern is that prior to the discussion of the seasonal and interannual cycles, it is simply a comparison, with little to no investigation into causes of similarities or differences. I believe there is the potential for greater impact with some more detailed discussion and/or reasoning in the earlier part of Section 3 or perhaps this section could be broken up into two sections “presentation of results” and “discussion of results”.

Please find my comments below. Note they are written in the order in which they came up, which may indicate to the authors that certain topics should be mentioned sooner rather than later.

Line 65: Whose AMOC estimates? To what does this refer?

Line 66-77: I think the author’s ought to be more careful about lumping all observation based estimates into two simple categories – satellites and in-situ, because some of the latter are based on observations of transport, some on observations of T&S, some on T with other assumptions to get at geostrophy, and some of completely different assumptions to estimate MOC/MHT from floats.

I realize it is a recent publication and does not include a line at 34.5°S, but I would recommend including a reference to Cainzos et al (2022) in this paragraph as it represents a recent investigation using another prevalent means of estimating the MOC and MHT from in situ observations. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021GL096527>
Authors’ choice of course.

Line 103: Is there a way to consider how biased all these reanalysis products are to surface observations. That is, how important are subsurface observations to their estimates? I ask because it concerns me that the near surface reanalysis product may be much improved compared to the model alone, but can the same be said for the deep ocean?

Line 124: Wouldn’t one expect a net southward transport in the Atlantic? I would have thought the net zero constraint should be applied globally.

Line 127-128: “Each observational product applies its own constraint to reference the flow.” This may be true, but I don’t understand the intention of this statement here.

Figure 1: Where is AABW?

Line 144: ...due to [the existence of](#) fewer observations ... (is this discussed elsewhere)

Line 146-147: density space versus pressure space. I completely agree, but this is not new observation nor is it specific to 34.5°S. Take a look, for example, at Lumpkin and Speer (2007) or the many works of Susan Lozier.

Line 148-149 – It seems this is an important point. Is there no way to include an illustration of this lack of sensitivity, even if it is shown as supplementary material?

Line 155: Perhaps I am misunderstanding. Given the overlap, I don't see how one can make any comparison at all amongst these products. I also don't understand how one can talk about an "increased spread in the time-mean MHT compared to the MOC." What scale is being used?

Line 170: Again, I feel like I am missing something here. Don't the ensemble means have the satellite record embedded in their estimates? If so, it would indicate a major issue if the two were not strongly related. Okay, I see the discussion Lines 180-184, but I would still argue that reanalyses are so dependent of the satellite record and that their characteristics must by necessity be closer to the near-surface focused observations. If this is the case, perhaps lines 180-184 should be the lead-in to the discussion.

Lines 192-195 – Perhaps there are too many curves or the figure is too squashed, I cannot see these trends in Figure 3. The same is true for the trends noted in the next paragraph.

Lines 205-210 – which begs the questions are the models and satellite estimates getting the boundary currents and is there something important in the middle of the basin that SAMBA is missing?

Line 274-279 – These sentences come off as an excuse not provide something thinking and analysis into the causes of differences or similarities. The true impact will come with some attempt to answer these questions.

Trivia:

Line 190: ... running mean overturning and MHT ... **are** relatively...

And elsewhere - "overturn" is the noun, "overturning" is the adjective

Table 1, Figures 1 & 2 and text: The SAMBA and Dong estimates. It took me a while to find the statement (lines 104-106 stating whose estimates were being used. These references should also be cited in at least one of the figure captions and in the succeeding captions the reader should be referred back to the figure that includes the citations.