

On behalf of my coauthors I would like to thanks both reviewers for their second review of the manuscript. Their comments and suggestions have considerably improved the manuscript. Reviewer #1 suggests publishing as it is while reviewer #2 suggests some technical corrections. Thus, we will carefully respond to each comment of reviewer #2 beneath.

Anonymous Referee #2

The authors have taken on board many of the comments in my original review, but not all of them. Perhaps my explanations were not clear enough. I have endeavoured to give clear explanations in my comments below. As with the earlier version, with revisions, I believe that this manuscript would be a useful addition to the literature.

In my original review, I noted that: “The title “Properties and mass transport differences across the Falkland Plateau between 1999 and 2010” does not express what the importance of the paper is. The values calculated are “volume transport” (units of metres cubed per second), not “mass transport” (units of kilograms per second). “Properties” is too vague – which properties? A title that summarises the key message or focus of the paper is needed.”

The authors’ response was: “We agree that the paper can use some clarification in stating which kind of transport units are used throughout the text. In line 32 we have described the relation between the units of mass and volume transport and specified that transport will be expressed in Sv. In addition, later in line 86 we have clarified now that the study uses mass transport. We have also changed the title to include the words “fronts” and “water masses”.”

The new title is “Differences between 1999 and 2010 across the Falkland Plateau: Fronts and water masses”, and this is an improvement. The authors say that they have “specified that the transport will be expressed in Sv”, yet they persist in referring to the transport throughout as “mass transport”, rather than “volume transport”. “Volume transport” is the normal phrase used in oceanography for the property measured in Sv, and I do not understand why the authors insist on calling this “mass transport”.

On one hand, the title has changed following the suggestion of this reviewer of avoiding the word “properties” on the title and we agree that it has improved the quality of the paper. On the other hand, the unit Sv can be used for volume or mass transport as can be seen in the following equivalence: $1 \text{ Sv} = 10^6 \text{ m}^3 \text{ s}^{-1} \approx 10^9 \text{ kg s}^{-1}$. A numerous amount of articles in physical oceanography use Sv for mass transport instead of volume transport. We will like to keep on using it. To alert the reader the word “mass” was added in most of the cases where we refer to transport. Here I’m showing some the latest works using Sv as mass transport in physical oceanography:

- Döös K., J. Kjellsson, Z. Jan, F. Laliberté, L. Brodeau, A. Aldama Campino

- (2017). The Coupled Ocean-Atmosphere Hydrothermohaline Circulation. *Journal of Climate*. Vol 30, pp 631-647. Doi: <http://dx.doi.org/10.1175/JCLI-D-15-0759.1>
- Evans G.R., E.L. McDonagh, B.A. King, H.L. Bryden, D.C. E. Bakker, P.J., Brown, U. Schuster, K.G. Speer, S.M. A. C. van Heuven (2017). South Atlantic interbasin exchanges of mass, heat, salt and anthropogenic carbon. *Progress in Oceanography*, Vol 151, Pages 62-82. Doi: <https://doi.org/10.1016/j.pocean.2016.11.005>
 - Vélez-Belchí, P., M. D. Pérez-Hernández, M. Casanova-Masjoan, L. Cana, and A. Hernández-Guerra (2017), On the seasonal variability of the Canary Current and the Atlantic Meridional Overturning Circulation, *J. Geophys. Res. Oceans*, 122, doi:10.1002/2017JC012774.
 - Hernández-Guerra A., E. Espino-Falcón, P. Vélez-Belchí, M.D. Pérez Hernández, A. Martínez-Marrero, L. Cana (2017). Recirculation of the Canary Current in fall. *Journal of Marine Systems*. doi: <https://doi.org/10.1016/j.jmarsys.2017.04.002>
 - Pontes, G. M., A. Sen Gupta, A. Taschetto (2016). Projected changes to South Atlantic boundary currents and confluence regions in the CMIP5 models: the role of wind and deep ocean changes. *Environmental research Letters II*. Vol 11, 9.

In my original review, I noted for what are now lines 66-72: “This paragraph basically says that the paper is organized with data and methods first, then results, then discussions and conclusions. Almost all scientific papers are organised that way, so this paragraph could be deleted. A more useful thing to have in its place would be a sentence that starts with “In this paper,. . .”, followed by the most important thing(s) that the paper shows/examines.” The authors’ response was: “We would like to keep this paragraph. Although it does not provide with important information it presents the outline of the manuscript, so the reader can decide what parts are more relevant for his/her purpose. On the other hand, the previous paragraph (lines 59-65) already states the important subjects that the paper examines.” I don’t know any readers who look for a paragraph at the end of the introduction to work out which parts are relevant to them. Most people with whom I have discussed “how do you read/review a paper?” say that they read the abstract first, then go through all the figures, then read the conclusion to see if it matches what they think the figures show, then look at the section headings in sequence, then read the text. I think the authors could strengthen the sentence at lines 62-65 to say what was achieved (currently it is stated as an objective), and

finish the introduction there.

In regard to this comment, the final paragraph of the introduction now reads as follows (lines 59-68):

“In this study, the water masses, relative geostrophic velocities and transports across an almost zonal hydrographic section carried out in 2010 along the Falkland Plateau are evaluated. These data, together with the ALBATROSS cruise, are the only high-resolution hydrographic data available on the region. Thus, results from the 2010 cruise are compared with those obtained from the 1999 cruise in the same area [Naveira Garabato *et al.*, 2003], with the objective of assessing possible relative transport and water mass differences between the two surveys. For changes in the relative transport the position of the fronts and the season in which each cruise took place will be considered. Changes in water masses, are decomposed into changes in the θ/S isobaric surfaces and results from the Bindoff and McDougall [1994] model.”

Line 81: In my original review, I noted that: “An accuracy of 0.001°C would mean that the SBE911+ CTD on the ship was new from the factory or had been recently calibrated (or post-cruise factory calibrated), because the specifications of the SBE911+ CTD say this is the initial accuracy, with a drift of “0.0002°C per month” (<http://www.seabird.com/sbe911plus-ctd>, under specifications tab). This may not be important for the level of accuracy required for the measurements presented in this manuscript, but more details should be given.” The authors’ response was: “The CTD was sent to SeaBird for calibration before the cruise.” However, the authors’ have not added this information to the manuscript. I believe it is an important detail, as not all CTDs are sent for pre- and post- cruise calibrations. At line 81, after the words “...and temperature sensors.”, the authors should add the sentence “The CTD was sent to SeaBird for calibration before the cruise.”

We agree, this has been added in line 77 where the reviewer suggests.

Lines 84-85: The authors have misunderstood my suggestion, and they have not made any changes to the manuscript in this respect. In my original review, I stated: “...the reference for PSS should be cited at the end of this sentence.” The authors have responded with: “As the reviewer says we have used the Practical Salinity Scale and this is specified in lines 84-85 of the manuscript to avoid confusion.”, but they have not made any changes to the manuscript. By “reference”, I meant that the authors should cite the paper/report that the PSS derives from: Unesco. 1981a. The Practical Salinity Scale 1978 and the International Equation of State of Seawater 1980. Techn. Pap. mar. sci, 36: 25 pp.

Following this suggestion the citation has been added to the text and the reference list.

Section 3.5: In my original review, I suggested rewording parts of section 3.5 to say: “The relative net transport is 9.2 Sv less during 2010 compared to during the ALBATROSS cruise as an outcome of a weaker SAF in 2010.” I also suggested “How 14.7 Sv less volume transport of the SAF leads to 9.2 Sv reduction in net transport would also be worth explaining, that is why volume transport changes are not directly additive.” The authors state in their response: “We have changed the first two paragraphs of section 3.5 following this comment from the reviewer.” The authors have changed the start of the second paragraph to read as follows: “The relative net transport during the MOC-Austral cruise is 9.2 Sv weaker than in the ALBATROSS cruise as an outcome of a more intense SAF. SASW, AAIW/AASW and UCDW present lower values in 2010 than in 1999, being the surface and intermediate stratus the ones with the highest decadal transport differences (Figure 7 and table 1).” The version of the first sentence that I suggested, “...weaker SAF in 2010”, and the authors’ new version, “more intense SAF” seem to be contradictory. Figure 3 and Figure 7 show that the SAF was weaker in 2010, but the way the authors have put “more intense SAF” with no qualifiers makes the reader infer that the SAF was more intense in 2010 (MOC-Austral cruise). I suggest that the words “more intense SAF” be followed by “in 1999” for clarity.

“In 1999” has been added at the end of this paragraph following this suggestion.

Figure 1: The authors have mostly followed my suggestions for changes, except that they have omitted the word “black” for the 2010 station numbers. I suggest this caption is modified to read “...MOC-Austral (2010, black station numbers)...” I agree with the other reviewer that it would be better to have consistent coloring of stations between Figure 1(a) and Figure 1(b) (and later figures). Changing the red station points/numbers in Figure 1(a) to grey would be the easiest way to do that.

The word “black” has been added.

Figure 10: This figure was added in response to a suggestion from the other reviewer. The figure shows accumulated relative geostrophic mass transport from AVISO 1993-2016 for all months of February and April, as well as ALBATROSS (April 1999) and MOC-Austral (February 2010) data. The AVISO February and

April data look like a smoothed version of the ALBATROSS data, and are very different from the MOC-Austral data. In the discussion section, more discussion on this would be interesting. Also, what was Figure 10 in the earlier version of the manuscript (maps of wind stress) is now Figure 11, but that figure is still referred to as Figure 10(a,b,c), which needs to be corrected.

Figure 10 reflects how the observed differences between the 1999 and 2010 transport estimates are due to interannual variability and not to seasonal changes. This is explained I lines 338 to 340.

The naming of the figures has been checked.