

Interactive comment on “Properties and mass transport differences across the Falkland Plateau between 1999 and 2010” by M. Dolores Pérez-Hernández et al.

Anonymous Referee #2

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General comments: This manuscript presents new data from 27 full-depth CTD stations across the Falkland Plateau in February/March 2010. The CTD stations were deliberately located at the same latitude and longitude positions of the April 1999 ALBATROSS cruise, to allow comparisons between the two data sets. The authors compare locations of fronts, water masses, and geostrophic volume transports (net, and for each water mass). This area is not an easy area to collect oceanographic data, because it is remote and has the Sub-Antarctic Front and Polar Front passing through it. The data presented are therefore important, and deserving of publication. Although well-written, the paper is lacking in some explanations, as detailed below in the specific comments. With revisions, this manuscript would be a useful addition to the literature.

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Specific comments: As noted above, although the data are important and deserving of publication, there are some revisions needed.

Line 1: 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.

Lines 13-28: The abstract summarises some of the main points, but does not tell the reader why they should read the full paper. At line 23, the term to “relative mass transport” is distracting, because what the authors have really looked at is “volume transport”. The changes in width and volume transport of the SAF and PF from 1999 to 2010 are listed, but it is not clear why these have occurred or why the changes might be important. The abstract should be rewritten to draw the reader into the full paper.

Lines 34-36: The authors set the scene at the opening lines of their paper by citing Orsi et al. (1995) and Cunningham et al. (2003) in regards to ACC transport being between 100 and 150 Sv. However, there are a number of very recent papers that indicate that ACC transport might be much higher than this (Donohue et al. (2016) and references therein (at page 11,766)). It would be worth the authors including discussion of the implications (if there are any) of those papers to the research presented in this manuscript.

Lines 87-88: With respect to the 2010 data, the authors state: “Relative geostrophic velocities are estimated using the sea bottom as level of no-motion.” However, Naveira Garabato et al. (2003) state for the 1999 data : “At each station pair, the reference velocity is initialized by performing a least squares fit of the geostrophic shear profile to the average detided water-track LADCP profile”, which (if I am reading this correctly) means the 1999 data used a different method to obtain geostrophic velocities (by adjusting them to LADCP measurements). Naveira Garabato et al. (2003) in their section

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3 then go on to discuss the issues with level of no motion assumptions. The authors of the present manuscript therefore need to explain why they used the level of no motion approach for the 2010 data, and whether they re-analysed the 1999 data using the same assumption or if they are using the 1999 data as processed by Naveira Garabato et al. (2003).

Table 1 (lines 425 onwards): The first three columns are ALBATROSS (1999) data, but the values in the table do not seem to match those given in Figure 14 of Naveira Garabato et al. (2003). For example, Table 1 states UCDW volume transport was 12.4 Sv, whereas Naveira Garabato give that volume transport as 23.5 ± 4.5 Sv. From reading the manuscript, I thought the same data was being used, so if a new analysis has been done, or there is some other reason for the values being different, then this should be explained.

Lines 265-335 (Discussion and conclusions): The discussions and conclusions do not really convey why the research was important. The main conclusions as presented in this section seem to be: (1) the observed changes in surface waters are because the measurements in 1999 (April=austral fall) were performed in a different season to 2010 (February=austral summer); (2) the intermediate waters underwent changes that are attributable to wind changes at their regions of formation; (3) the salinity and temperature do not change much for the CDW layers.

However, the conclusions above do not really connect with some of the statements in the “Results” section, e.g., lines 163-169, where it states “In between stations 9-12 where the SAF stands, the UCDW exhibits a remarkable increase in salinity.” I also found it surprising that the authors did not directly mention the 1998-1999 ENSO and SAM events that Naveira Garabato et al. (2009) say were so important for the AAIW properties, and the implications therefore of comparing the ALBATROSS results with the 2010 ones. There needs to be some overall important conclusions presented from the research.

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Technical corrections: Lines 3-5: It is completely up to the authors how they wish to have their names presented, but I have never seen Professor Naveira Garabato's paternal and maternal surnames hyphenated before.

Line 56: "data" is plural, so this line should read "data from this cruise have been. . ."

Line 57: Delete "with"

Line 59: "confronted" is the wrong word to use here.

Line 66: "realizations" is the wrong word to use here

Lines 67-73: 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.

Line 82: "accurary" should be "accuracy" (presumably)

Line 83: 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.

Line 86: I have no issues with the Practical Salinity Scale (rather than Absolute Salinity from TEOS-10) being used in this research, especially because the authors are making comparisons with earlier published work that was published using PSS. However, the reference for PSS should be cited at the end of this sentence.

Lines 89-90: ". . . modifications attending to the present water masses" – it is not clear to me what this means.

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Line 193: “doesn’t” is too informal for a scientific paper, please change to “does not”.

Lines 235-236 and 238-239: At lines 235-236, the authors state “. . .the SAF-associated jet is displaced westward and weakens 14.7 Sv as compared with the ALBATROSS observations”, then at lines 238-239 the authors state “The relative net transport is 9.2 Sv greater during the ALBATROSS cruise as an outcome of a more intense SAF.” It would be easier for the reader to follow this line of argument if the comparisons were consistent, so something like this: “. . .the SAF-associated jet in 2010 was displaced westward and was weaker by 14.7 Sv compared with the ALBATROSS observations”, then “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.” 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.

Lines 255-256: “The total transports. . .” – the authors have already stated these results at lines 239-241, so this sentence could be removed.

Figure 1 at lines 491-496: It looks like the 2010 stations were at the same locations as the ALBATROSS stations on the scale of this map, so rather than saying “red dots” and “black dots”, perhaps just “red station numbers” and “black station numbers” would be sufficient. The figure caption should also say “Hydrographic stations across the Falkland Plateau. . .”, because ALBATROSS included other stations not shown on this map.

Figure 4 at lines 522-564: The labels for $\Delta\theta$ and ΔS should be next to the colorbar, not on the vertical axes. The “decade” is 1999 to 2010, but if the authors are trying to say “2010 minus 1999”, then they should use the word “minus” rather than a hyphen (or a – rather than a -). The figure caption would be easier for the reader to understand if it began: “Vertical sections of differences in (a) potential temperature and (c) salinity for the decade 1999 to 2010.” The figure caption also states that station numbers and fronts are shown in gray and in black, but only black station numbers are showing. It

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would be enough to just include black station numbers, and refer readers to Figure 1 for the ALBATROSS station numbers.

Throughout the text: The original Naveira Garabato et al. (2003) paper does not have a hyphen between surnames, yet when cited in this manuscript that paper is given with a hyphen. Sometimes the authors abbreviate decibars as “dbar” and sometimes as “db”. Using “dbar” throughout would be consistent with other oceanographic literature, e.g., Naveira Garabato et al. (2003).

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