

## ***Interactive comment on “Moored observations of mesoscale features in the Cape Basin: Characteristics and local impacts on water mass distributions” by Marion Kersalé et al.***

### **Anonymous Referee #3**

Received and published: 21 December 2017

Review of Moored observations of mesoscale features in the Cape Basin: Characteristics and local impacts on water mass distributions By M. Kersale, T. Lamont, S. Speich, T. Terre, R. Laxenaire, M. J. Roberts, M. A. van den Berg and I. J. Ansorge

This manuscript outlines the analysis of 14 months of data from an array of moorings and CPIESs deployed in the South Atlantic near the Cape Basin as part of a basin-wide South Atlantic MOC array along 34.5°S, together with satellite observations. Their analysis focuses on the identification of mesoscale features impacting the moored observations. The in situ data set is unique, and the analyses presented provide some useful insights about the regional circulation at the Cape Basin providing eddy statis-

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tics that are in agreement with previous studies, and detailed analyses of case studies (anticyclonic eddy, cyclonic eddy, cold and warm water intrusions).

One concern is that there are many instances where the manuscript is imprecise and more details are needed for some of the methods. There is little (or no) information about configuration and set up of the instruments and calibration issues, how have the authors performed the quality control of the different types of data, or which are the associated error bars of the different measured variables. For the CPIES/GEM analysis the robustness of the relation between vertical profiles of temperature, salinity, density and measured tau is not shown, even though it is key to the analysis presented comparing mooring and CPIES data. For instance, it would be good to know how does the GEM perform in the deep ocean, how many deep casts are used to build the GEM, etc. The manuscript relies on an unpublished method (Laxenaire et al. 2017 submitted) for the eddy analyses. I suggest that the eddy detection method should be carefully explained to provide more guidance to the reader (for example, lines 128 and 154).

Another concern is that the authors express many times the significance of understanding these mesoscale features to understand MOC variability without really explaining the reason for that, and in particular (if it's meant for future work) how that will be accomplished. Most of the introduction is dedicated to the MOC and MOC arrays, but there is very little explained about the connection between the findings in this study and MOC variability. The main objective of the manuscript should be clearly stated and the introduction must be targeted to provide the necessary background for what will be presented in the following sections. If the focus of the paper will be on the local dynamics (as the title and results suggest) more background on regional aspects is needed. I suggest putting this work in the context of the SAMOC/SAMBA project strategy/objectives making it clear what the eastern part of the SAMBA array will address and how is it likely to contribute to improve the understanding of MOC variability and, specially, on which time scales.

My overall recommendation is that the manuscript needs to be revised and strength-

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ened before publication.

Please find specific comments below.

The abstract needs to be revised in order to reflect the main findings of this work.

Line 14: change to South Atlantic Meridional Overturning circulation Basin-wide Array (SAMBA).

Please include previous literature regarding the main circulation patterns/boundary current systems in the Introduction. A schematic of the main currents/circulation patterns on Figure 1 could be useful.

Line 57: there are updated ACC transport estimates through Drake Passage

Line 64: It is not clear how the western boundary buoyancy anomalies have been looked at. Did these studies looked at the mesoscale eddy field?

Line 85: '...some accurate information' I suggest rephrasing this to try to make a better statement.

Lines 86-88: This a quite strong statement. I suggest leaving it for the outlook at the end of the manuscript with some explanation for why do you think that is true.

Line 93: The usage of the term 'tall' moorings is not clear. Would 'full depth' mooring suit better?

Line 108: 'destroyed and lost'. Maybe it was just 'lost'?

Line 113: replace 'various' with 'five'. Please add information about horizontal resolution of the hydrographic sections.

Line 116: Salinity and density are not directly 'measured' by the CTD. Please clarify.

Line 123: It may be worth clarifying here that satellite will give information of the dynamics at the surface.

Lines 135-152: Part of this could go to the Introduction.

Line 153: what is the 'C line'? Laxenaire et al method should be explained if their paper is still unpublished during the revision of this manuscript.

Line 169: How do you know this? Which is the approximate depth of the Ekman layer here? Are there any seasonal variations?

Lines 180-186: Which type of filtering is applied to compare the velocities from altimetry and velocity from ADCPs? How is aliasing by the sampling resolution of the altimetry addressed? The conclusion about the validation of the altimetry-derived velocities with the ADCP velocities should be approached with more caution, given the values for the correlation coefficients. A correlation coefficient of 0.7 leaves about 50% of the variance unexplained. It could be useful to show a comparison between the time series of the velocities from altimetry and from the ADCP to provide more faith in the validation analysis.

Line 189: Does the upper layer include subsurface waters? Please give a depth range

Line 276-277: Is ARMW a newly identified water mass or has it been identified before in all the studies mentioned there?

Line 229: Given the text structure below, I would replace 'four' case studies by 'three' case studies

Lines 266-267: '. . .to recover the regional water masses for each mooring'. This is not clear, what is shown in Figure 10? Is it the depth range occupied by each water mass? Figure 10 is not very informative. The main information from the figure could go to a Table (see below).

Lines 270-282: It would be nice to condense the information about water masses on a Table to make it easier for the reader to follow.

Lines 294 -295: Please add an interpretation

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Line 310: Please add an interpretation about the low correlation coefficients found for the deeper levels.

Line 311: There are correlation coefficients values before in the text (Section 3.3), the description of the method for estimating their significance should be provided before.

Lines 318-322: It is not clear with respect to which means are these percent changes estimated from.

Line 353: I suggest changing 'high spatial and temporal scales' with 'high spatial and temporal resolution'

Line 365: Please add references for the previous estimates

Lines 366-367: 'accurate description'... this needs more evidence

Line 396: add 'Ocean' after 'Indian'

Line 408: what is the decorrelation scale number here?

Line 410: 'these first independent observations comparisons' Do you mean between ADCP and altimetry, and between moorings/CPIES?

Line 411: 'some confidence' Please try to rephrase.

In the Discussion, I think that a better case could be made describing which are the essential new findings of this study compared with previous studies, and what have we learned from this new data set.

Lines 411-413: It is not clear how this will be accomplished. How is the eastern boundary current system variability is going to be estimated from the present array configuration? How are these mesoscale features likely to impact MOC strength/variability? For instance, do you expect them to average out (or not) for the basin-wide MOC calculation?

Some general comments:

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In general: To define an acronym first it is necessary to use the full words and then in brackets the acronym should be defined. For instance, Acoustic Doppler Profiler (ADCP).

I find it confusing that the authors use the same nomenclature for an instrument's site (for instance C1) and an eddy identified as a cyclone (also C1).

Figure 4: For the caption I suggest adding 'for selected dates between' September 19, 2014 and October 15, 2015 ' ...

Figures 6-8: This is perhaps a matter of style, but I strongly suggest providing complete figure captions.

Figure 9: Please specify that this diagram corresponds to the eastern part of the SAMBA array

Figure 11: For identifying water masses it is more appropriate to use neutral density as the vertical coordinate instead of depth.

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2017-85>, 2017.

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