

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 #2

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This paper presents a description of mooring, CPIES, altimetry, and SST data in order to study the impact of eddies on water masses within the Cape Basin. The paper uses clear language and is easy to read. Unfortunately, I find that the analyses of the data presented do not generally support the conclusions, and that some interpretations (especially of the altimetry data) are rather questionable.

As an example, the abstract claims that the data of the SAMBA array are used to assess the "nonlinear, mesoscale dynamics of the Cape Basin". I am having difficulty to find where exactly in the manuscript such nonlinear dynamics are described and studied. Another example found in the abstract is that "future investigations with longer

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time series ... will ... ultimately improve our understanding of the strength and variability of the Meridional Overturning Circulation". I am really wondering where in this article such a thing is suggested from the results. In summary, while the title reflects the content of the paper, most of the abstract does not. About the introduction: it is useful to provide some context about the MOC and the SAMBA experiment, but there is too much of it since this is not the topic of the paper. More background should be given about the hydrography and oceanography of the region, as well as the characteristics of eddies in this region.

Another aspect of the study that I am very concerned about is the use of the eddy detection algorithm of Laxenaire et al. 2017, a paper not yet accepted for publication at the time of submission of this paper. An example of puzzling result is found in Figure 7: are we to understand that anticyclonic eddy A19 has grown in size by an order of magnitude from 22-April-2015 to 26-April-2015, and that cyclonic eddy C14 suddenly appeared between these dates? Even if C14 is generated at the Benguela front, it does not appear at all like a coherent structure shed from the Benguela Current. I realize that the Cape Cauldron is a very energetic region where tracking eddies (in the sense of coherent structures) is difficult, but maybe another algorithm could be tested against the one of Laxenaire? Or maybe the atlas of eddies by Chelton et al. could be used? Also, does not it look observations at mooring M4 are more representative of the meandering Benguela current?

Another and final aspect of the study that I find worrying are the conclusions based on the temperature and salinity changes (Figure 11). I understand that the authors attempt to show more clearly the potential changes from mooring and CPIES data by showing percentages of changes (compared to which means?), but are we to be compelled by changes of salinity of the order of less than 0.5%? Or even temperature changes of the order of less than 10%?. Often, when alleged eddies are passing the moorings, I am not seeing much in the time series of Figure 3. How large are these changes compared to, let's say, the total standard deviation of the records, or again the standard deviations

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outside of eddy "events"?

The authors have at their disposal a very valuable dataset of mooring and CPIES observations that are clearly under-utilized with this study. There have been methods developed to detect eddies in mooring data, the paper Lilly and Rhines 2002, Coherent Eddies in the Labrador Sea Observed from a mooring, comes to mind ([https://doi.org/10.1175/1520-0485\(2002\)032<0585:CEITLS>2.0.CO;2](https://doi.org/10.1175/1520-0485(2002)032<0585:CEITLS>2.0.CO;2)). The CPIES data should also be able to tell you a lot more about the processes taking place such as transport, even if, as you state, the decorrelation length scale is smaller (what is it?)

In summary, even if this paper is elegantly written, I am afraid that its scientific significance is poor to fair at this stage, that its scientific quality is poor to fair, and that its presentation quality is good. An important concern is that the abstract is not representative of the results.

Some more detailed comments:

I 15: nonlinear: what is demonstrated to be non linear here?

I 18: these mesoscale features: which ones?

I 24: substantial role of these mesoscale features: you have not shown how large are the "eddy"-related changes in T and S compared to their sources of variability.

I 71: lead -> led?

I 101: moorings have a sub-surface depth of 500 m: I understand what you mean but this is an odd way of describing the mooring.

I 115-116: the authors know very well that a CTD does not measure salinity and density, please rephrase.

I 140: The Agulhas is traditionally said to retroflect, not reflect

I 165-66: what are the tolerances given? standard deviations or standard errors of the

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mean or confidence intervals? please specify.

I 186: accurate: i would temper this by something like "reasonable". Do not forget that a correlation of 0.72 implies that about only 52% of the variance can be explained.

Figure 5 & 6 and others: please add units close to colorbars

Figure 10 is introduced before Figure 9? and Figure 10 is really not insightful.

Figure 10 should contain the definition of the water mass acronyms.

line 283: stabilizes? what do you mean? is present?

Figure 1: you should state in the caption that the CPIES estimate for the cyclone is missing

line 331: after its recovery and re-deployment: do you mean before the re-deployment?

line 365: what are the previous estimates?

line 408: the decorrelation length scale is smaller than this distance: and what is it?

line 411-413: "Future investigations with longer time series at these existing sites will lead to a better understanding of the eastern boundary current variability and Indo-Atlantic exchanges, and ultimately improve our understanding of the strength and variability of the AMOC."

Ok, this is for further investigation, but you are not even hinting how this could be done. How are your mooring observations going to inform you on the variability of the AMOC? How are your results on water masses and eddies going to be utilized when constructing the trans-basin array. If you want to talk about the AMOC this is what you need to discuss.

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