

Interactive comment on “On the role of circulation and mixing in the ventilation of oxygen minimum zones with a focus on the eastern tropical North Atlantic” by P. Brandt et al.

Anonymous Referee #1

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This article largely reviews recent results from the SFB 754 program designed to investigate the climate and biogeochemistry interactions in the oxygen minimum zones (OMZs) of the tropical oceans. It is very well written and gives a thorough and complete overview of the major results to date. Since it is primarily a review/progress article, it is difficult to find fault with any of the results since the article mainly reports and synthesizes the results rather than (re)interpret these results or present new results. So, consequently this review provides (hopefully) constructive comments rather than a scientific critique of the published record.

I very much liked the layout of the paper, and the discussion of the individual components of the oxygen budget and the main mechanisms that influence this budget in
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the eastern tropical Atlantic. An excellent approach. However I think in general there could have been more discussion of the error bars of the budget, particularly in the individual sections that discuss the processes. Most sections lacked any error bars on the estimates, other than to note that the mechanisms might be poorly constrained (a good reason to show or explicitly discuss the error bars and how they are comprised). Or perhaps error bars were presented in the accompanying figures (e.g. Figure 12, 13 showing the effect of diapycnal mixing) but there was little discussion of how these error bars were computed.

In the section 4.3 Advection I kept wondering why there was no actual quantification of this component. It was not until the conclusions that it was reported that this component is so poorly resolved that it is actually represented as a (large!) residual in the budget. This information needs to be reported much earlier. The reason this component cannot be resolved is because there are insufficient and/or inadequate measurements available to determine this component. This raises another issue. Given the disparate and large number of measurements collected as part of the SFB 754 program, it might also be worthwhile discussing what measurements might still be required and at what resolution. In other words, it is an ideal time to determine what legacy measurements might remain and what additional measurements (e.g. multiple glider transects crossing the deep tropical jets instrumented with O₂ sensors etc?) might be needed for monitoring the changes in the OMZ and the processes that lead to these changes.

Finally, given the length of the paper, I think that it's probably best to only focus on the OMZ in the eastern tropical Atlantic Ocean and carve out the comparison with the Pacific for another paper later. It really is a very meaty paper already and there is a lot to digest!

Minor Comments:

1. Page 12075: Is there any seasonal variation of the shallow OMZ?
2. Page 12077, line 6: I could not wrap my head around this first sentence of this

paragraph. Is there a simpler way to write this?

3. Page 12081: How good is the assumption that meridional advection is negligible? What about the possible significance of cross-equatorial exchanges via thermocline convergence, upwelling and Ekman divergence?

4. Figure 3 caption needs more information about how these oxygen concentration estimates were determined.

5. Figure 17. What causes the big spike at sigma-theta 26.1 in the AOOR values determined for the North Atlantic basin mean (black dots?)

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