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Biogeosciences Discussions

Interactive comment on "Linking diverse nutrient patterns to different water masses within anticyclonic eddies in the upwelling system off Peru" *by* Yonss Saranga José et al.

Anonymous Referee #2

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Eddies play an important role in modulating the physical and biogeochemical environments in eastern boundary upwelling systems. The authors analyze two simulated eddies in the Humbolt upwelling system. They argue that horizontal entrainment instead of biogeochemical dynamics governs biogeochemical properties inside eddies. While the mechanism is plausible, it is not sufficiently supported by the presented analysis.

Major comments:

1. Description of models is too brief. This study employs the BioEBUS model, citing a relatively recent paper [Gutknecht et al. 2013]. I don't think many readers is familiar with the model and the paper. I would suggest the authors to describe the model and the parameters in an appendix or in supplementary materials.

2. Suggest adding a figure to show the domain extent.

3. The model is insufficiently validated:

– In figs. 2(a) and (b), the model seems to capture the chlorophyll pattern correctly, but underestimate nearshore chlorophyll and overestimate offshore chlorophyll. I think this can be fixed by adjusting parameters in the biogeochemical model.

– In Figs. 2(c) and (d), the strength of the OMZ is indistinguishable due to the choice of colorbar and color scale.

– The left and middle panels of Fig. 3 suggest that the model overestimates mixed layer depth.

– In the right panel of Fig. 3, the model does not capture the high NO2 concentration in the OMZ. The authors argue that benthic process is the cause for the discrepancy. The claim is not convincing as 78.5W is quite away from any ocean bottom. I suspect the authors could adjust model parameters for oxygen-dependent nitrification/denitrification and get a better agreement.

4. In Figs. 7 and 9, averages over the upper 400 meters are presented while the difference in NO3 and NO2 between the two eddies are between 100 to 200 m. Could the authors also carry out an analysis for fluxes and concentrations between 100m and 200m?

5. While the authors claim advection is the dominant process for NO3 and NO2 concentration within eddies, there is no estimate of the advective flux. I would suggest the authors to add results for advective fluxes.

Editorial comments: 1. Fig. 3: the panels should be labeled as (a), (b), and (c) instead of (a), (c), and (e). 2. Caption for Fig. 7: "B_{sim}" should be "A_{sim}" 3. Caption for Fig. 10 needs to be revised.

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