

Interactive comment on “The seasonal and interannual variabilities of the barrier layer thickness in the tropical Indian Ocean” by Xu Yuan and Zhongbo Su

Anonymous Referee #1

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This paper investigated the seasonal and interannual variability of BLT in the TIO by using SODA version 3 reanalysis dataset from 1980 to 2015. This research points out that the BLT shows a significant seasonal variation in the TIO, which is related to the variations of the sea surface salinity and the thermocline. The author also claimed both the Indian Ocean Dipole and ENSO events could impact the variation of BLT by affecting the thermocline in the TIO. Overall, the paper might be considered for publication once mandatory major changes are made. All my suggestions are listed below:

Major comments:

C1

1. Line38-40: How about the definition: MLD in density with a variable threshold criterion (equivalent to a 0.2°C decrease)? Are there any differences by using the suggested new definition in calculating the MLD, and further for the BLT variation?
2. As the author explained, the BLT is defined by the difference of the MLD and ILD. What's the seasonal and inter-annual variation of these two aspects? Which one can mainly determine the BLT?
3. This paper mainly gave the seasonal and inter-annual variation of BLT in the TIO, but the mechanism for these was not explained enough. As the BLT is affected not only by the SST, SSS, thermocline, but also by the wind stress, rainfall or the fresh water input and even the net heat flux input. More work on mechanism analysis is encouraged.
4. The explanation of the impact of ENSO on the BLT variation is simply accorded to the theory of Xie et al. (2002). Did you really find the anomalous easterlies? The Walker Circulation is also needed to be verified.
5. Can you show the time series of the SSS, BLT and thermocline during the whole period of 1980-2015? Do the IOD or the ENSO event mainly contribute to the inter-annual variation?

Minor comments:

1. Line33-34: What variation?
2. Line 53-54: INTER-TROPICAL CONVERGENCE ZONE (ITCZ)?
3. Line 124: 2005-2015 => 2005-2015?
4. Section 3 might be too short. Author could explain more about figure 1 or move this section to the next section.
5. Line 213: The caption of figure 4: lead-leg?
6. Line 252: The lines could be plotted above the shaded area in figure 6.

C2

