

Review of Bastin et al 2023 for Ocean Sciences

General comments

This paper investigates different potential forcing mechanisms for the observed widening (compared to theoretical equatorial waves) of the equatorial deep jets using a range of idealized models. This paper is generally well written with clean figures, but often assuming too much background information from the readers, and the specific messaging of the mechanisms for widening could be cleaned up. Overall, the paper provided a theoretical step forward to understand the puzzling phenomena of Equatorial Deep Jets, and thus suitably significant for publication.

Specific comments

1. Abstract. The abstract could be stronger if it ended with implications for this work on our understanding of the deep jets and highlighted the significance of the work.
2. L26-33. This motivation is good, and it might read better if it were placed before the explanation of the potential mechanisms driving the deep jets.
3. Introduction. By the end of this section, I was left wondering what are the general gaps in the fields. Highlighting the gaps progressively as they become narrower to the questions you are addressing would be helpful for background information.
4. Section 2.1. A figure might be helpful to show the model domain and orient the reader. In addition, the acronyms/handles that you use to explain the model simulations are a bit hard to follow for your analysis. It may be helpful to use descriptors for the model runs when you discuss them in the results and conclusions. In general, if you could use words to describe intraseasonal momentum flux convergence instead of exclusively the acronym may also be helpful.
5. L222-230. This paragraph is confusing because it is hard to follow with the experiment nomenclature, see above. It also contains a bit of discussion that would seem to fit better later in the paper. This paragraph may be better served as a time to walk the reader through Figure 4, as suggested by your topic sentence.
6. L254-260. This paragraph could be moved forward to walk through figure 4, see the previous comment. It is also a bit heavy in jargon, but is a very important result!

7. Figure 5. I am not sure this figure is effective. I am unclear about how it adds to your story. Consider removing it or combining it with figure 3? It seems like its purpose is to show that your model describes deep jets effectively, which would need to be moved forward in the paper.
8. L287-300. This paragraph is really important, but it seems like model validation. Maybe the section 3.2 moves forward as a model validation?
9. Section 3.3. This section is a bit hard to follow in terms of keeping the different mechanisms separate, starting with a very long first paragraph. Is there a way to subsection it out to investigate each potential mechanism separately.
10. Section 4. I am still confused about what the instantaneous deep jet width versus the meandering time mean width. For figure 10h, I expected the meandering width to be larger because it would include the instantaneous component and variability from the meandering, but it is not. Maybe you can clarify in the discussion?

Technical comments

1. L6. Instantaneous widening is a bit confusing a term for non-specialists, consider
2. L7-8. This sentence was confusing because in the previous one you said that the meandering wasn't important, and now you are explaining more about it. Maybe in the previous sentence, you can indicate the relative importance of the mechanisms (like about 1/3) instead of implying that the meandering isn't important.
3. L34. This sentence is awkward, consider "d'Orgeville et al. (2007), Ascani et al. (2015) and Matthieen et al. (2017) have shown the"
4. L51-53. This sentence was a bit hard to follow. Consider separating it into two.
5. L141. It may be a personal preference, but it can be awkward to start sentences, especially paragraphs with because.
6. L176-180. I would switch the order of these sentences and instead say we do this and then justify rather than the other way around.
7. Figure 1. How long is the spin up time?
8. L249. Youngs and Johnson (2015) → (Youngs and Johnson 2015)
9. L364-367. Maybe you could quantify the proportions of each mechanism, like 1/10th or 1/3rd to give readers intuition for these processes.