Weather Clim. Dynam. Discuss.,
https://doi.org/10.5194/wcd-2020-47-RC2, 2020

Interactive comment on "African Easterly Waves in an Idealized General Circulation Model: Instability and Wavepacket Diagnostics" *by* Joshua White and Anantha Aiyyer

Anonymous Referee #2

Received and published: 4 December 2020

The study investigates the evolution of wave packets that develop in different basic states in an idealised GCM. Those basic states include the climatology in JJAS between 1987 and 2017, 755 individual basic states based on 15-day averages of the JJAS data, and three averages based on the lifetime of the wavepackackets in the 755 basic states. The study found that a localized AEJ supports downstream and upstream dispersive wavepackets. The authors point out that the response is independent of how the waves have been triggered. They also show that the wavepackets remain withing the AEJ and are not swept away. This study builds up on previous work by Hall et al. (2006), Thorncroft et al. (2008) and Leroux and Hall (2009), using a very similar model set up to allow for direct comparison to the previous studies. The authors include the

effects of moist convection and dust radiative forcing in their experiment to study the wavepacket response. The results of this study provide inside into the dynamics of the AEJ and AEWs and will be of interest to the community.

Minor comments:

1. P. 2, l.45 and p.3, l. 62: It is not clear what you mean by "antifriction" in this context. Could you use a different word or provide a bit more explanation in the text?

2. P. 3, l. 60: What do you mean my "the background PV gradient is single-signed"? Do you mean by that that there is no meridional reversal of the PV gradient?

3. P. 3, l. 78: "s" does not need to be in italics.

4. Figure 1 and others: Why don't you call the time-longitude diagrams Hovmoeller plots? You do refer to them later in the text. They are a common type of diagram so why not be consistent throughout? Also, in Latex you can use the correct way of writing with two dots on the "o", which I can't do in Word.

5. Figure 1: The caption would be easier to read if you move (a) before "the year 2006" and (b) before "2008". You use this order of giving the labels of the subplots in some of the later figure captions. It would be good to be consistent. I think ERAI is more commonly abbreviated with a capital "I".

6. P. 2, l. 94: "the wavepackets are collocated with the AEJ" – Are you referring to the right column of Figure 6? However, you are still talking about Fig. 1 and I can't see the location of the AEJ. Could you potentially add the jet location using contours?

7. P. 4, l. 93: Avoid using "significant" if you haven't carried out any significance tests.

8. P. 4, l. 97: Remove space before the full stop.

9. P. 4: l. 99: Include "relation" or something similar after "this".

10. General comment: You start a number of sentences with "this" also in consecutive

sentences. It is not always clear what “this” refers to and makes the sentences a bit unspecific. That could be avoided by adding, for instance, a noun after “this”.

11. P. 4, l. 101: What does “its” refer to? The wavepacket?

12. P. 6, l. 137: Remove “also”.

13. P. 7, l. 155: What do you mean by “this posits”?

14. P. 7, l. 179: Hemispheres – plural needed here.

15. P. 8, l. 202, 204: Comma needed after the equation.

16. P. 8, l. 208-208: What do you mean by “it”?

17. P. 8-9: l.211-220: After the dash start with an upper-case letter. I think it is a bit confusing that you give the total number of basic states of 779 before you explain how you create them. Could you say “in the following three types of basic states:” in line 201 and then insert after the itemization something like “In total that gives 779 basic states”.

18. P. 9, l. 222: “Each simulation”. I’m not really sure how you run these simulations. Do you drive the GCM with each of the basic states? Could you make that clearer in the text?

19. Fig. 3: From the text it is clear that the figure is based on the climatological basic state, but that is not clear from the figure caption.

20. Figs. 4, 7: Add “horizontal” before “wind”.

21. P. 10, l 229: “fixed heating produces a baroclinic vortex” – Where and why? A bit more explanation would be good here.

22. P. 10. L. 235, p. 13, l. 266, p. 14, l. 273: Delete “clearly” and in other places too. “Clear” and “clearly” can mean different things to different people.

23. Fig. 5: Why does panel (a) have no colour bar? Or is it the same as in (b)? That

is not obvious. The black dot here and in other figures is a bit hard to see and it looks more like a half circle than a dot.

24. Fig. 6 and a few other of the following figures: The labels are too small to read. Is that because of the resolution of the figure? Is that lower for the review process than for publication? It would be better to make sure that labels can be read easily.

25. P. 12, l. 246: When talking about surface westerlies, please refer to the right column of Fig. 6. I assume this is where you want the reader to look at.

26. P. 12, l. 250: “Consistent with it” – “it” refers to what?

27. Section 4.2: Why is the behaviour so different for the long-lived basic stated compared to the short-lived and intermediate basic state?

28. P. 14, l. 283: Is there no commonly used symbol for the growth rate? A dot is missing at the end of the sentence.

29. P. 14, l. 292: p and A need to be defined as well.

30. P. 16, l 297: Perturbation velocity has already been defined. Remove the space before the comma.

31. P. 14, l. 300: What do you mean by “half-wavelengths in the zonal direction”?

32. P. 14, l. 303-304: Remove the space before the degree symbols.

33. Fig. 13. Here the labels are too small again. In the bottom row the labels seem to be partially cut off. Labelling the subfigures with a, b, c, d would be good. In the caption you refer only to panel (a) and not the others.

34. P. 17, l. 307: Lower-case “in”.

35. P. 17, l. 309: What do you mean by “these additional energy sources”? Are you referring to the destabilizing role of moist convection and SMD?

36. P. 17, l. 316 – 317. Three sentences begin with “this”. Particularity the last “this”’

is unspecific.

37. Fig. 14: Levels are cut off on the y-axis of panel (a). Lower-case ‘s’ for steamfunction and remove the space before the degree symbol.

38. Fig. 15: The labels are too small.

39. P. 18, l. 321: Sometimes you reference equations as Eq. X and sometimes as Equation X. Please be consistent.

40. Fig 16: Panels need labels.

41. P. 19, l. 328: Comma after “however”.

42. P. 19, l. 330: Comma after “case” and delete “this is”.

43. P. 19, l. 335: Not clear what you mean by “this” here. Do you mean your study or analysis?

44. P. 19, l. 343: What do you mean “three additional simulations are performed”?

45. P. 20, l. 347: PV has already been defined, so please use it.

46. P. 20, l. 358: Insert “located” before “above”.

47. P. 20, l. 258-355: When you say stronger and higher please add compared to what. Consider adding a comma after “conversions” and replacing “this” with “which”.

48. P. 21, l. 379: You could remind the reader what you mean by “criticism regarding the limited zonal extent of the AEJ” as this is one of your main points.

49. P. 21, l. 383: Do you mean your results? What does “this” refer to? There is another “this” in the next sentence.

50. P. 21, l. 395-396: The hyphens have a different length.

51. The list of references contains inconsistencies. For some papers the paper title is written so that every first letter of the word is a capital letter, but for some papers that

is not the case.

Interactive comment on Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2020-47, 2020.