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# ***Interactive comment on “Interactions between the Somali Current eddies during the summer monsoon: insights from a numerical study” by C. Q. C. Akuetevi et al.***

## **Anonymous Referee #2**

Received and published: 10 July 2015

### General comments:

The manuscript describes the fast interactions between the large anticyclonic gyres, Southern Gyre, Great Whirl and Socotra Eddy, developing off the Somali coast during the Southwest Monsoon. The study based on three hindcast simulations of the global ocean circulation, which differ by resolution, atmospheric forcing and parametrization. The authors focus on the generating mechanism of the cyclones flanking the Great Whirl and on the nature of interaction between the Southern Gyre and the Great Whirl. As direct observations are very sparse in this region this is an important contribution to the analysis of the development of the fast dynamics of the Somali eddies as the 5 days snapshots of all three simulations allow to follow the evolution of the eddies. My

C399

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main concerns are that some parts of the text are unclear, lack discussion and need to be better structured. In chapter 4.2.2 several points are a bit vague, the cyclones should be described more precisely and it is very difficult to follow the conclusions of the authors (see my detailed comments below). Chapters 4.3.1 and 4.3.2 should be restructured. Chapter 4.3.1 starts with the results by presenting three different scenarios, which are discussed in the next chapter 4.3.2. I find these two chapters extremely difficult to read, as it suffers from jumping back and forth between the figures and chapters. The text would be easier to follow if each scenario would be addressed in a separate chapter. Therefore, I think that the paper could be significantly improved by rewriting and restructuring of the paragraphs. Thus, I recommend publication of this manuscript after major revision.

Specific comments:

1. P737, I7: “is the GW” – A sentence about the generation mechanism of the GW would be helpful here (as on p752, I1-4).
2. P738, I6-9: Sentence too long and clumsy, please rewrite.
3. P740, I25: “Monthly mean” – too imprecisely, you should say that the monthly mean is calculated for the last 10 years of the simulation (as written in the Fig. 1 figure caption).
4. P741, I19: The GW and the SE disappear in November – do you know what happens to the SG?
5. P743, I6-8: In Fig. 3-5 results from only two experiments,  $1/4^\circ$ MJM95 and  $1/12^\circ$ MAL84, are shown, but the text says that “detachments of positive vorticity from the WBC are observed in all three experiments”.
6. P744, I6: I can’t see the cyclone in the currents, maybe a close up with a higher resolution would be helpful.
7. P744, I9-10: I can’t see that the cyclone weakens the eddy or even contributes to its

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decay – Fig. 3 shows a strong GW.

8. P744, I15: I don't understand the statement that the cyclonic vortex "drifts in the open ocean" – in which figure is this shown.

9. P744, I19: "clearly influences the circulation" - This statement is very vague.

10. P744, I24: "greatly triggering the mixing of upwelled waters within the eddies and offshore region" – There is no mixing in offshore regions shown.

11. P746, I7: The SG should not be renamed in "new Great Whirl". This is confusing as it is still the northward migrated Southern Gyre (same on p748, I12).

12. P746, I12: Fig. 7 does not show SST.

13. P748, I14: The GW should not be renamed in "Socotra Eddy" or "new SE" just because the GW took its place (same on p750, I17).

14. P748, I22: "This formation process of the new GW and the SE were not previously identified and it challenges the collapse interpretation based on the collapse of the two cold wedges." I don't understand the sentence.

15. P753, I20-21: remove the following part of the sentence as it is needless: "which are not the reality but an attempt to represent it as well as possible"

16. P759, Fig. 1: Do you have an idea why the anti-cyclonic SG cannot be identified by an elevated SSH – in contrast to the GW. For a better validation maybe you should show SSH as well as surface circulation from observations, maybe from AVISO or, for the surface circulation, from the YoMaHa climatology from Argo floats. The surface circulation does not show the resolution of  $\frac{1}{4}^{\circ}$ .

17. P760, Fig. 2: Do you use the current speed U or the current speed, which is orthogonal to the oblique section? I recommend the latter (same for Fig. 6).

18. P762, Fig. 4: Remove the last four sentences of the figure caption ("The Southern

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Gyre (SG) does not move northward. . . A Socotra Eddy (SE) is seen east of the Socotra island.”), as this does not belong to the figure caption and should be written in the text.

19. P763, Fig. 5: Remove the last sentence of the figure caption (“It illustrates the collision. . . and the Socotra Eddy.”), as this should be described in the text.

20. P764, Fig. 6: Fig. 6 should be moved after Fig. 8.

21. P765, Fig. 7: The figure caption should provide information about the figure (relative vorticity and spiciness). “to illustrate the collapse of the two cold wedges. . . to become a new Great Whirl” does not belong to the figure caption. Please, rewrite the figure caption.

22. P766, Fig. 8: Please add information about the figure (relative vorticity and spiciness).

Technical corrections:

1. p737, l15: in size

2. p737, l17: Jensen (1991) and Wirth et al. (2002)

3. p739, l4 and p752, l20: Southwest Monsoon

4. P742, l7: Fig. 2c -> Fig. 2b

5. P745, l16: Figs. 4 to 7.

6. P746, l10: For a better understanding add the number of the chapter “discussed in detail below (4.3.2)”

7. P748, l19: Fig. 36 (typo?)

8. P752, l15: They are sometimes detached. . .

9. P759-767, Fig. 1-9: The labelling of the axes and/or colorbars is too small in all of the figures. Small letters in the plots would help to indicate the plots.

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10. P759, Fig. 1: The current vectors are too small, it's hard to recognize any of the currents. "SC", "EACC" and "SECC" are very difficult to see, maybe you show mark them in black.

11. P760, Fig. 2d: Depth labels should be positive (same in Fig. 6). Small letters (a-d) are missing in the panels.

12. P760, Fig. 2a: The colormap of the relative vorticity should be consistent: colormap of Fig. 2a and 3 differ from Fig.4, 5, 7, 8 and 9.

13. P761, Fig. 3: The panels should be arranged so that time increases from top to bottom as in the following figure.

14. P763, Fig. 5: Spiciness (middle sequence of snapshots) and SST (lower sequence of snapshots) are in a different order as in the figure caption. The colorbars should be placed on the right side of each sequence (or the sequences should be arranged from top to bottom with the colorbar below).

15. P765, Fig. 7, figure caption: From 1/12°MAL84 experiment. . .

16. P766, Fig. 8, figure caption: . . .from 1/12°MAL95 experiment.

17. P767, Fig. 9: Please add (a) and (b) to the panels.

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