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Discussions

Interactive comment on "Multicore structures and the splitting and merging of eddies in global oceans from satellite altimeter data" *by* Wei Cui et al.

Anonymous Referee #2

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The authors present a eddy detection algorithm which is able to identify multiple cores eddies structures which are mainly associated with splitting and merging events. If there is now a large number of eddy detection and tracking algorithm available, only a very few are able to identify merging and splitting events. For this reason this paper deserve attention. Such eddy-eddy interactions may indeed strongly impact the reconstruction of the eddy trajectory and its estimated lifetime if the tracking procedure does not account for them. However, few other methods were recently used to identify merging and splitting events from altimetry data sets and they should be properly referenced in the introduction. In a second stage, the authors provide statistical maps of eddy merging and splitting events on the global ocean for a 23 year-period. The

authors mention that splitting and merging events do not always occur most frequently in eddy-rich region. This is a very interesting aspect that should be deepened a little bit more.

Overall my recommendation is that the editor accept this article if the following remarks and suggestions are satisfactorily addressed.

1- Only few eddy detection and tracking algorithm are able to identify merging or splitting events. In order to describe the state of the art, the authors should refer to them explicitly in the introduction, especially in the fourth paragraph:

- Li, Q. Y., Sun, L., Liu, S. S., Xian, T., and Yan, Y. F.: A new mononuclear eddy identification method with simple splitting strategies, Remote Sensing Letters, 5(1), 65-72, 2014.

- Daisuke M., F. Araki, Y. Inoue, H. Sasaki, A New Approach to Ocean Eddy Detection, Tracking, and Event Visualization –Application to the Northwest Pacific Ocean, Procedia Computer Science,v 80,2016,1601-1611, https://doi.org/10.1016/j.procs.2016.05.491.

- Le Vu, B., A. Stegner, and T. Arsouze, 2018: Angular Momentum Eddy Detection and Tracking Algorithm (AMEDA) and its application to coastal eddy formation. J. Atmos. Oceanic Technol., 35, 739–762, https://doi.org/10.1175/JTECH-D-17-0010.1

- Laxenaire, R., Speich, S., Blanke, B., Chaigneau, A., Pegliasco, C., & Stegner, A. (2018). Anticyclonic eddies connecting the western boundaries of Indian and Atlantic Oceans. Journal of Geophysical Research: Oceans, 123. https://doi.org/10.1029/2018JC014270.

2-Page 9 , line 273 'Although a cyclonic eddy could theoretically merge directly with an anticyclonic eddy, the mixing process is too complex and the observation of such an event too difficult for the current research.' When opposite sign vortices get close to each other they tend to form a dipolar structure which propagate at a constant speed.

As far as I own no numerical simulations, laboratory experiments or remote sensing observation has shown that a cyclone and an anticyclonic could merge together ! This statement should be suppressed or precise references, showing such event, should be provided here.

3-Flow chart figure 2. It seems that a third arrow indicating the possbility of single eddy (>6days) with a transient double core structure should be present at the end of the flowchart between the splitting and the merging events. Such case should correspond to the column 5 of the table 1, if I'm not mistaken.

4- page 16 line 421: the authors do not provides here the number of (single-core) eddies with lifetimes > 6 days (numbers are given only for >30 days or >100 days) in order to compare with the number of multicore structures (> 6 days) mentioned just before.

5- page 17 lines 428-440 : the recent paper of Garreau et al. 2018 (https://doi.org 10.1029/2017JC013667) which depict the consecutive splitting and merging of the same anticyclone with its parent eddy could also be mentioned here.

6- Page 19, lines 485-500: the authors mention that merging and splitting events are not correlated to eddy-rich regions. It is indeed interesting to highlights specific areas where the ratio (eddy-eddy events)/(total nb of eddies) is higher than the statistical mean. However, the mentioned areas (Antarctic Circumpolar Current, the Gulf Stream and its extension, Kuroshio Extension, Agulhas Return Current, and Brazil–Malvinas Confluence Zone) seems to me 'eddy-rich regions'. A more quantitative analysis could be done here to provide such statistical ratio or the correlation between the eddy life-times and the splitting-merging events as suggested by the authors.

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