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Discussions

Interactive comment on "Single super-vortex as a proxy for ocean surface flow fields" *by* Imre M. Jánosi et al.

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We thank the Referee for the report and the supporting remarks. Please find here our responses to the minor comments. We attach the revised manuscript as Supplement, where two new figures and several changes (also detailed here) are inserted.

Referee remark (1): "Pg 1 ln 15: You can add "some exceptions to the remote sensing of eddies are the in situ description of an anticyclone in the North Atlantic by Martin and Richards (2001) and the sampling of an anticyclone in the Algerian basin along its main axes by Cotroneo et al. (2016)""

Response (1): After a pretty long consideration we decided not to insert the suggested papers. This is because they are loosely related to our work, which is primarily a

statistical analysis of an extended oceanic flow field. Many other studies focusing on individual vortices should be listed as "exeptions to the remote sensing", and we would like to limit the length of reference list to be tractable.

Referee remark (2): "Pg 2 ln 17: You should add the aim of this work that is missing in the section "Introduction""

Response (2): Following your suggestion, we inserted a whole paragraph to the end of Introduction as follows (Pg 2 ln 8): "The original aim of our work was a detailed analysis of kinetic energy budget of the oceanic surface flow field along the U.S. West Coast. At the evaluation of integrated kinetic energy and enstrophy squared vorticity), we found a non-trivial strong temporal correlation between these quantities. Since the dominating flow features are obviously mesoscale eddies (Fig. 1}), it is rather straightforward to formulate an explanation related to the description of individual ocean vortices. One of the basic models is the Gaussian geostrophic vortex exhibiting the attractive features of finite total energy and total enstrophy over an infinite domain, and a simple closed relationship between them. We demonstrate here that a single Gaussian super-vortex properly describes the empirical energy/enstrophy ratio over an extended region, furthermore the height and radius of such super-vortex are strongly related to the mean values over the same area obtained by classical vortex census."

Referee remark (3): "Fig 1: add the geographical references, the square and the stripes of integration and finally the "visual contour" of the super vortex (see pg 4 ln 17)."

Response (3): Following your suggestion, we inserted a new Figure (Fig. 4 in the revised manuscript), where we illustrate all the integration frames (apart from the vertical meridional stripes of width of 1 and 2 degrees), and the visual contour of the super-vortex. Probably it is better than pushing everything in Fig. 1.

Referee remark (4): "Pg 3 ln 11: Why the core of such a vortex is surrounded by a ring of opposite vorticity? Add references or explain better"

Response (4): This is simply a basic property of a Gaussian vortex. Nevertheless, in order to make this point clear, we inserted a new Figure (Fig. 2 in the revised manuscript), where we plot the height profile, tangential velocity and vertical vorticity Eqs. (1)-(3). Note that opposite vorticity does not mean a reversed circulation.

Referee remark (5): "Pg 8 ln 33: why did you chose 60 days? Please, provide a reason."

Response (5): As requested, we inserted an explanation for the cut of 60 days as follows (Pg 10 ln 27-29): "The cut of 60 days is somewhat arbitrary, however we think that the detection error from both the limited spatial and temporal resolutions is larger for short living vortices (note that the typical westward traveling distance during 60 days is $\sim$ 155 - 200 km)."

Finally, we thank for the general suggestion, we are currently working on the extension of the concept to different geographic locations.

Please also note the supplement to this comment:
https://www.ocean-sci-discuss.net/os-2019-14/os-2019-14-AC1-supplement.pdf

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