

Interactive comment on “Manifestation of two meddies in altimetry and sea-surface temperature” by I. Bashmachnikov et al.

Anonymous Referee #1

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This paper makes use of a number of observational data sets (altimetry, ship-board ADCP profiles, ARGO float profiles, SST data) to support the finding that meddies can be tracked from the ocean surface (by tracking their anticyclonic eddy surface signal) in those cases when they are not interacting with other strong coherent features, such as the Azores Current or cyclonic eddies. This topic has been discussed in two previous papers by the authors, but here satellite SST data is also used to identify surface temperature anomalies related to meddy signal. I think the results are interesting and worth of publication, but I would suggest the authors revise the presentation substantially as there are several points that remain unclear to me or that could be explained more clearly. This also concerns some of the figures, which are beautiful but also very small. I have included a few main comments below, together with several suggestions on how to improve the presentation of the results.

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Main comments:

1) I would be very careful in stating that any subsurface eddy can be tracked from the ocean surface: this statement is admittedly not very strong in the manuscript, but it is included in the abstract as well as in another couple of places within the main text. This is because, as the authors surely agree, upper ocean vorticity can be determined by so many different processes (strong currents, surface eddies, atmospheric forcing) that only subsurface eddies propagating in regions devoid of such strong processes are likely to imprint a detectable surface signal.

2) Judging from the red arrows in Fig. 1a and also from Fig. 1d, it seems that the velocities are more representative of an anticyclonic eddy northern boundary (the velocities are west-southwestward). Therefore, I wonder if the surface eddy signal isn't shifted to the south of transect 2, which would be in better agreement with the SST signal shown in Fig. 4a.

3) end of page 3082, discussion about surface water convergence: if the surface signal of the anticyclone is characterized by positive SLA, then I would expect surface flow divergence and subsurface convergence towards the center of the eddy (upwelling).

4) page 3084, last paragraph starting with row 10: why would colder fluid entrained from the north be advected towards the center and warmer fluid from the south be wrapped around the eddy core? That would indicate a surface convergence process. It seems to me that the second mechanism described by the authors (lateral entrainment along doming isopycnals) may be more plausible in this case.

Suggestions (and some questions) about the presentation:

1) In the Introduction, it would be nice to show a typical meddy temperature/salinity anomaly profile, to use as a reference for meddy water characteristics. An estimate from the mentioned ARGO profiles could be used for example (ARGO data are mentioned on page 3076, but not shown). This figure could also contain a second

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panel showing topography and the names of topographic/geographic features mentioned throughout the paper.

2) page 3073: I could not understand very well the mechanism described in the sentence on row 23-24 ('This is attributed to formation of beta-gyres...'): could you please elaborate a bit more?

3) page 3076, row 25: it seems to me that also the zonal eddy currents between the surface and ~300 m are changed by the filtering (Fig 1d). They are quite reduced with respect to the unfiltered signal, suggesting a much more southwestward flow than the one depicted in Fig. 1b.

4) page 3077: the description of how the eddy center and radius are estimated should be clarified at a number of points:

*) did you use filtered or unfiltered velocities?

*) how do you choose x_w, x_e (points of minimum velocity between 2 maxima within a region identified by the altimetry as an eddy)?

*) α is current direction with respect to what?

*) how are y_w and y_e defined? Do you really need them? Isn't it simply, for both w and e : $y_c - (x_c - x) \tan(\beta)$ and $R \sim \sqrt{((x_c - x)^2 + (y_c - y)^2 \tan^2(\beta))}$?

5) Sections 2.2 and 2.3: for the purposes of tracking the meddy surface signal, it would be very useful to see animations of relative vorticity and SST anomalies (and maybe SSH). Perhaps it is possible to add them as additional supporting material?

6) Fig. 4a and 5: I think it would be better to show SST anomalies with respect to a mean climatological monthly field, rather than the absolute SST values (the authors speak about anomalies in the text, but absolute values are actually shown).

7) page 3080, rows 22-23: 'SST anomaly ... should be advected 1.3deg further south': further south with respect to what location?

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8) page 3081, last row: typo 'AGRO' instead of ARGO.

9) page 3083, row 23: by 'surface dynamical anomalies' is it meant SSH and relative vorticity anomalies?

10) Figures 1a, 3, 4a and 5 are busy figures and would greatly benefit from a much larger size (in the current version, it is sometimes difficult to distinguish vectors, contours or specific colors). Other suggestions about reducing visual complexity:

*) do you need to show topography contours in Fig. 1a, 4a and 5?

*) Fig. 1a would benefit from a simpler color palette for SSH (either monochrome or bicolor). It would help in better identifying the velocity vectors. A bicolor color palette could also be used in Figs. 3a, 4a and 5, if showing SST anomalies.

11) Fig 1a caption: I would use cm/s and not mm/s. Could remove 'Present' and 'Present the' after (b) and (c), respectively.

12) Fig. 6 caption: the two sets of red and blue lines are not described separately (as done for Fig. 7b, for example).

13) in a few places within the manuscript, the words 'The later ...' should be 'The latter..'

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