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Ocean Science Discussions

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

Anonymous Referee #2

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This paper summarizes observations of two Mediterranean overflow eddies (meddies). The observations include shipboard ADCP transects, Argo float profiles, CTD casts and satellite observations of sea surface temperature (SST) and sea surface height (SSH). The authors have published previous investigations of meddies and in this study expand their repertoire of observations to include satellite data. The observations presented within this manuscript are unique and display a synergistic approach to integrate in-situ and remotely sensed measurements. The major problem that I identified in this manuscript is that the authors did not make a compelling case that the satellite observation were of the meddy and not other eddies within the region of the meddy. The radial scale of the meddy is nearly a factor of 5 too small to be detected by merged SSH observations. The authors state that the meddies are associated with a different, but connected surface eddy that has a radial scale almost half as large as can be re-

solved by the SSH fields used in this study (this excludes the along-track SSH data also investigated in this study). The link of the meddy to the surface eddy is not made clear in the text and the satellite observations do not appear to show any evidence of the meddy, but only of this proposed different, but connected, surface anticyclone. The observations presented in this manuscript are interesting and represent an important contribution to the study of mesoscale eddies. If the authors can clearly make the link between the satellite observations and the meddies, this manuscript would be a worthy publication.

Major Edits: Page 3076, Line 4: The use of the term "resolution" in the description of the SSH data is not correct. The AVISO SSH data is gridded to $\sim \frac{1}{3}$ degree but the data have a wavelength resolution closer to 2 degrees (see appendix A of Chelton et al., 2011b). This wavelength resolution resulting in the ability to resolve eddies with an approximate Gaussian SSH structure with an e-folding scale of $\sim$40 km at 30 degrees of latitude. Therefore the statements that the AVISO SSH fields have a resolution of $\frac{1}{3}$ degree is not entirely correct. The same is true for the discussion of the resolution of the SST fields, however I'm not aware of what the true resolution of these data are. I recommend that the authors replace the word "resolution" with a statement along the lines of "the fields are smoothed and interpolated to a grid with spacing of $\sim \frac{1}{3}$ degree."

This misinterpretation of the resolution limitations of the satellite observations leads to what I believe to be a major issue with this paper that needs to be addressed prior to publication. The observed meddies have a radial scale of $\sim$7-10 km. The authors then show that the meddies are observed to coexist with a different anticyclonic eddy above them with a radius of $\sim$ 25 km. This upper-eddy is still too small in spatial scale to be resolved by the merged SSH fields used in this study. It is not clear in figures 1 and 3 where the SSH structure of this upper-eddy is located in relation to the observed subsurface location of the meddy. In the following comments I identify where the authors fail to make a convincing argument that meddies can be observed in satellite observations.

Page 3078, Line 3: The authors show that the meddies are collocated with an anticyclonic surface signal, which they call the "meddy surface signal." It is not clear from the text why this is observed, nor how these upper-eddies influence the dynamics of the meddies. It is also not clear if the upper-eddies are permanently linked to the meddies. This could result in the SSH and SST observations of the upper-eddies not always be collocated with the meddies below. On Page 3078, the author states "... This suggest that we are dealing with two connected, but different eddies." This idea needs to be further developed and clarified as the satellite observations appear to not be of the meddy, but of these "different eddies."

Minor Comments: Page 3073, Line 11-19. It would be clearer if the outline of the paper was placed at the end of the introduction section.

Page 3078, Lie 16. Add "is" between "It" and "more" in the second sentence that starts on this line.

Page 3079, Line 1. Insert "to" between "easy" and "obtaining", change "obtaining" to "obtain." Line 5. If the SSH anomaly is compared relative to the closest SLA minima, does this minima change in time? What if the meddy propagated into the vicinity of a cyclonic eddy, would the new minima be the centroid of the cyclones and hence the meddy SLA would be referenced to a new minima and could change, even if there were no changes in the SSH signature of the meddy?

Page 3084, Lines 1-27. This description of why the authors expect meddies to have a cold SST signature needs to be moved to the introduction. Placing this discussion in the last section leaves the reading wondering why the authors expect to see cold SST anomalies in the cores of meddies.

Page 3090, Figure 2b. Please add intermediate tick marks on the x axis and a background grid to the figure.

Figure 3a. It is not clear to me where the SSH signature of the meddy is in this figure?

Page 3092, Figure 4a. It is not clear if the advection of SST is a result of the surface currents of the meddy, or just meanders of the background current. This figure is not convincing in the argument that meddies can be observed in SST data.

Figure 5. The dominant influence of the meddy on SST in these two figures (a and b) appears to be the advection of SST around the meddy and not a cold-core, as is hinted at in the text.

Through: Replace ARGO with Argo, as Argo is not an acronym, but a name chosen to emphasize the strong complementary relationship of the global float array with the Jason satellite altimeter mission. Argo was the ship upon which Jason sailed (Greek mythology).

References: Chelton, D.B., Schlax, M.G. and Samelson, R.M. Global observations of nonlinear mesoscale eddies. Progress in Oceanography (2011) doi:10.1016/j.pocean.2011.01.002

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