Ocean Sci. Discuss., 9, C893–C901, 2012
www.ocean-sci-discuss.net/9/C893/2012/

Ocean Science
Discussions

Interactive comment on "Surface signature of Mediterranean water eddies in the North-East Atlantic: effect of the upper ocean stratification" *by* I. Bashmachnikov and X. Carton

I. Bashmachnikov and X. Carton

igorb@fc.ul.pt

Received and published: 23 August 2012

We thank referee number 1 for his thorough analysis of our papers and for his numerous suggestions

Main remarks:

Do we know why meddies move through the ocean? I was wondering whether meddies propagate like a wave, are self advecting, or are advected by background currents. Can upper ocean currents or another eddy advect a deeper meddy? Are meddies' trajectores influenced by local topography? Maybe all these are relevant. Perhaps a few words about this would help the reader's understanding.

We will add information on that matter in the Introduction, namely:

The propagation of meddies in the ocean may be a result of various mechanisms. The simplest such mechanism is the advection of a meddy by an ambient currents (currents at the depth of the meddy, or barotropic currents). But typically a more efficient process is the advection of a meddy by "beta gyres", that is the formation of an antisymmetric internal dipole circulation inside the meddy, which, in turn, advects the meddy (Morel, 1995). "Beta gyres" in a meddy may be formed by planetary, baroclinic or topographic beta effects. Due to baroclinic beta effect "beta gyres" are formed via a vertical tilt of the isopycnals above or below a meddy, which leads to vertical squeezing or stretching of the meddy, which becomes horizontally asymmetric. As a result a meddy may be advected by a baroclinic ambient current (for instance a current in a layer only above or below the meddy). For baroclinic currents, direct advection by the current may be annihilated by beta gyres associated with the mean-flow potential vorticity gradient (Vandermeirsch et al., 2001), leaving other effects to dominate. Except for advection by strong ambient currents, the resulting meddy propagation speeds are a few cm s-1.

More specific comments:

Title: Suggest using "Northeastern" instead of "North-East." This will be corrected

Abstract, line 1: Meddies are detectable and measurable at the sea surface, but are they "visible?" Who sees them?

Indeed, this was an awkward expression; they can be measured by active or passive sensors like radars or radiometers. This will be corrected.

Abstract, line, 11-12: I suggest you add approximate latitude limits to your "northern subtropics" and "northern tropics." And also add them to Table 3. I am not sure of the relevant latitudes and would like help figuring this out.

This will be done

Page 2459, 10: Are the surface azimuthal velocities actually measured velocities, or

were they calculated from variations of sea surface height?

They were calculated geostrophically. This will be indicated in the new version.

Page 2460, 3: Suggest using “RAFOS floats’ trajectories” or “RAFOS float trajectories”

This will be corrected

Page 2461, line 9: To my ear “1.2 times smaller” sounds strange. Maybe use something like 80% as large or 20% smaller?

This will be corrected

2464, 10-11: “H is typically 200 m less than H. . .”?

In fact it is H_tilde is typically 200 m less than H

2467-2469: I take on faith the dynamical arguments here. Maybe someone more familiar with the dynamics could comment.

Ok

2468, 7: I think the authors meant to use “temporarily” instead of “temporally.”

Indeed it is a mistake; this will be corrected

2469, 20: Suggest removing the first “the”

Indeed it is a mistake; this will be corrected

2470, 2-3: Sentence needs help. Maybe say: “This is partly compensated by the altimetric tracks becoming closer to each other and the AVISO mesh being reduced from 29 km. . .”

Indeed, this mistake escaped our attention. This will be corrected

2470, 14: Suggest adding a “the” after “represent”

Thank you. This will be corrected

2470, 17: meddies

Thank you. This will be corrected

2470, 26: Ceres was

Thank you. This will be corrected

2472, 25: Suggest adding “the” before “description” and maybe “of the meddy’s intensity and dynamics” after “description”

Thank you. This will be corrected

2473, 1: in the literature

This will be corrected

2473, 11: Not sure what “registered journey” means. Maybe say “tracked journey”?

Yes it was awkward. This will be corrected

2474, 18: The -.05–0.15f initially confused me with two minus signs. Suggest rewrite.

We changed the sentence to: “The related sea-surface elevation and relative vorticity anomaly peaked near the meddy center and reached 5 to 15 cm and -0.05 to -0.15 , respectively.”

2474, 21: Suggest insert “the isopycnals” in “return to” for clarity.

This will be corrected

2475, 25-26: The phrase “a mean background flow may shed the surface signal away” sounds strange to my ear and is not clear to me. Maybe use something like “the background flow causes the surface signal to separate from the meddy” or something like this.

Yes the phrasing was bad. This will be corrected

2476, 1: Does “its surface signal” refer to the cyclone (as implied) or the meddy?

This refers to the meddy surface signal. This is not clear and it will be corrected.

Table 1: caption says “sorted from weaker to more intense ones.” What was used to judge intensity? Notes below the table use “expandable..BTs” and should use “expendable.”

Thank you for correcting the spelling error. Concerning the fact that the meddies were sorted from weaker to stronger ones, in fact, it was based on the Rossby number (excluding the last four meddies for which less information was available). But again, this ranking was only approximate; this phrase will be deleted in the revised version (it does not bring necessary information)

Fig. 1. Caption: the symbols in panel (a) are dots, or disks, or filled in circles; a circle is a line around a center point. The black ring could also be a black circle.

Thank you. This will be corrected

Figure Captions 2 and 3 might want to mention which way the meddies were going, to be clear.

This will be indicated by arrows in the figures 1-3 as in the figure below.

Fig. 6. The “thick grey line with triangles” symbols look to me like dots; all the symbols look similar in my version of the figure, maybe due to my poor eyesight.

Indeed, the symbols should be enlarged and more contrasted. This will be corrected.

Fig. 7. I like this figure a lot, but I was puzzled by it for awhile and couldn’t figure out which curves went with which meddy. To help the poor first time reader I suggest you add small arrows pointing from each meddy name to the two relevant curves for that meddy. The caption mentions circles but shows dots too.

Thank you; we will improve this figure (as below) and correct its caption.

Fig. 8. Caption: Suggest you change H-Rm (implied subtraction) to H, Rm as in Fig 9. Caption mentions grey circles and white circles, which are actually dots or filled-in circles.

Thank you. This will be corrected. ÌĘ Fig. 9. Grey dots. The Meddy B2 symbol is not a circle or a dot. Not sure what it is a little house with sloping sides?

Thank you. The figure will be corrected as below.

Interactive comment on Ocean Sci. Discuss., 9, 2457, 2012.

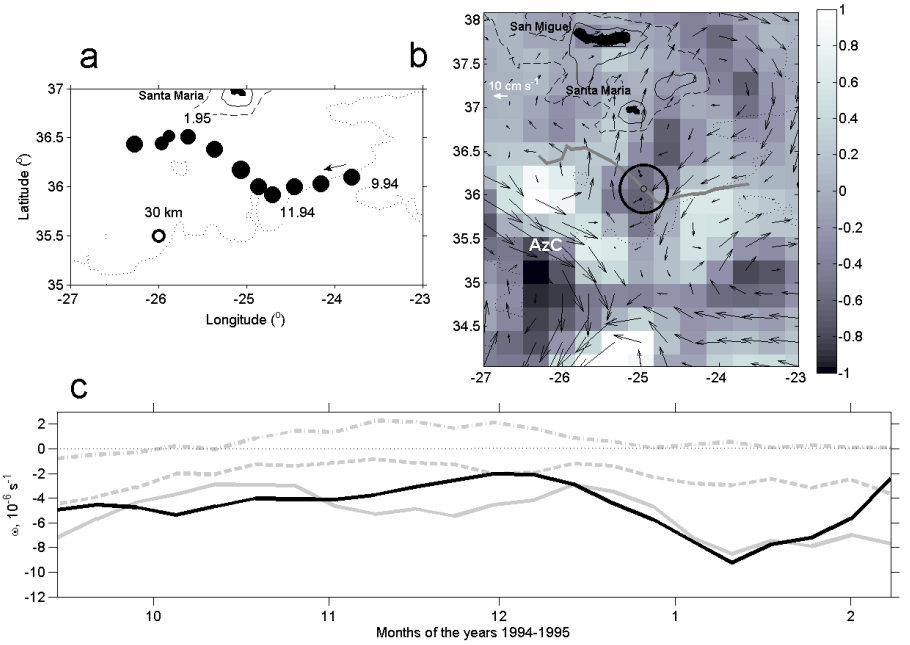

Fig. 1. Fig. 1. Temporal evolution of the characteristics of meddy Zoe and of its surface signature.

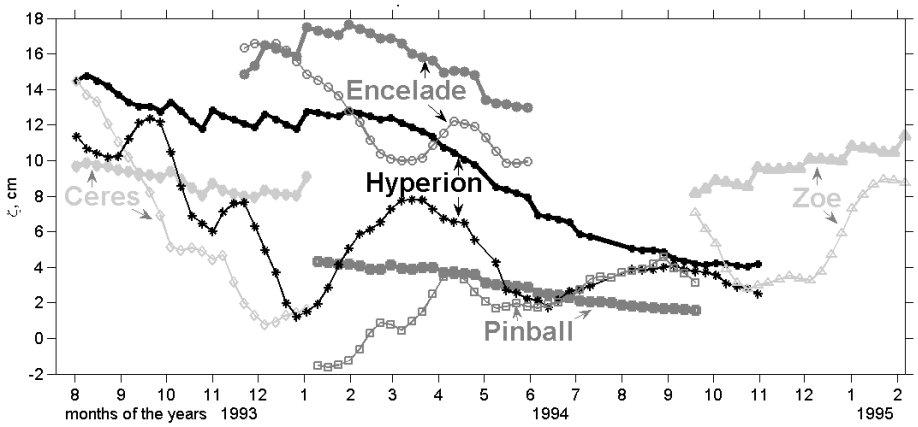

Fig. 2. Fig. 7. Sea-level anomalies above meddies (cm) computed from AVISO altimetry (thin lines) and via expression (10) (thick lines) .

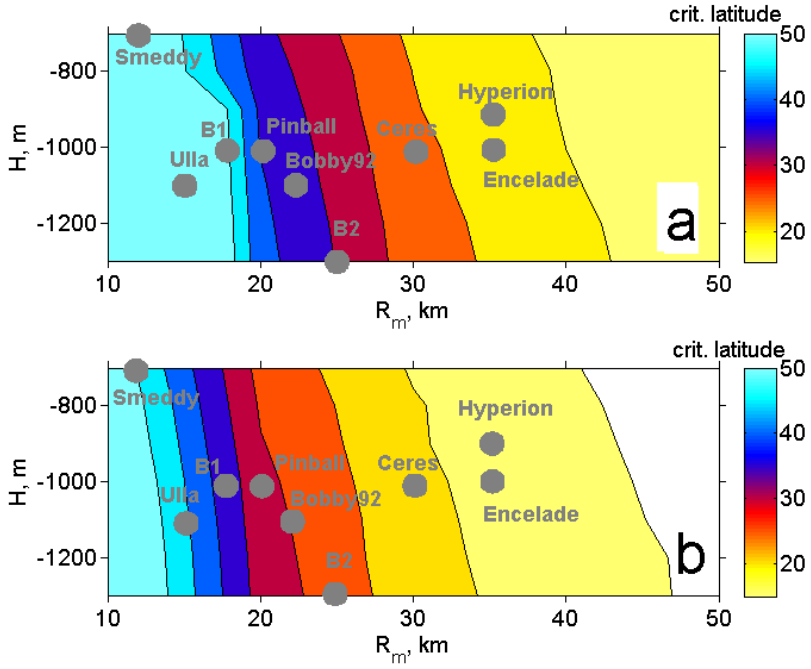

Fig. 3. Fig. 9. Critical latitudes, presented as a function of meddy core depth and of its dynamic radius.