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Ocean Science Discussions



# *Interactive comment on* "Transformation of Levantine Intermediate Water tracked by MedArgo floats in Western Mediterranean" *by* M. Emelianov et al.

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Dear Mikhail,

Here are my additional comments:

For what concerns the specific problem of the bathymetry and of the location of the MWs veins that should follow isobaths, even though the clustering method addressing the LIW layer as now defined by the authors cannot apply, I think that interesting information can nevertheless be provided by the method. Indeed, I think it could be very demonstrative to just plot the location of those profiles that do not have a S extremum:

-some of these profiles will probably be located in the interior of the basin where the bathymetry is larger than let's say 1000 m. If the maximum depth of the profile is a few 100s m only, it will be considered as inadequate for the purpose of the analysis and totally rejected. But if the maximum depth of the profile is larger than the "normal" depth of the LIW layer, then the S maximum will probably be relatively low, hence indicative of the quasi absence of LIW. Still plotting these "not-clusterised" profiles with "coldest colours" will be informative.

-some of these profiles will certainly be located over the upper part of the continental slope and it should be easy to check that the depth of the profile roughly corresponds to the bathymetry, both being lower than let's say 400-500 m. There, the S maximum will probably be relatively large, even if maybe lower than the S extremum of the neighbouring clusterised profiles. Still plotting these "not-clusterised" profiles with "warmest colours" will also be informative.

Specific comments:

-P.570, l.24: ***I suggest "alongslope displacement".

-P.570, l.25: "more to the west than the most transformed one" is unclear. First, it must be specified that the sentence concerns LIW along the slope of Sardinia in the Algerian subbasin. Second it should be more convenient to say "that LIW as unmixed as the LIW generally found alongslope can be found nearby in the interior of a subbasin".

Response: We don't fully understand your comment. We should discuss this more in depth.

***My additional comment: distribution of any water mass in the Med (and in any such enclosed sea) should NOT be considered as "relative to N, S, E or W" but "relative to the bathymetry in general and the continental slope in particular". For instance, "downstream" anywhere in the sea must be considered as "alongslope anticlockwise", NOT as, for instance "more to the west of ". This leads to the general situation that



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waters are more and more mixed downstream, i.e. from their zone of formation, then alongslope anticlockwise up to where they escape from a given domain and/or are too mixed to be still identified. Over this general situation, the effect of mesoscale eddies that are able to trap water from alongslope and catch it while they drift away from the slope must be added; the most "famous" example of this process is the entrainment of LIW by Algerian Eddies, but we are personally convinced that LIW in particular can also be entrained away from the slope by eddies such as Pelops and Ierapetra in the eastern basin (see Millot and Taupier-Letage, 2005).

-P. 575, l .10: I did not understand what is "the thermohaline inversion often observed". Please detail and comment.

Response: The new version of this sentence is: "The Theta,S curve from this cast is relatively uniform and does not have the thermohaline inhomogeneities often observed above and below LIW core in other areas of the basin. These peculiarities are mainly formed by the processes of mixing and stirring of LIW with surrounded water masses."

***OK, this is clear now.

-P.575, l. 17-18: one understands that the process invoked is double diffusion but this is not explicitly said; in addition, it is not explained why this process would lead to heterogeneities in the horizontal. This needs to be explained more carefully.

Response: The new version of this sentence is: "After crossing the channel area, as current velocities decrease, the "emulsion of LIW" returns to be separated into continuous (background layer) and dispersed (saltier and warmer lenses) phases. The thermohaline inhomogeneities begin to appear on Theta,S profiles due to double-diffusive mixing, which tends to diminish the remaining excesses of salt and heat (Kelley, 2001)."

***OK, this is more clear now.

-P. 576, l. 6-7: I think that the overall description of the "background transformation" could be improved. I personally think about LIW (and other water masses as well)



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continuously changing roughly anywhere, due to continuous mixing under normal conditions, and encountering, in a discontinuously manner, changes here and there: in the narrow passages (always), when de-structured by mesoscale eddies (from time to time and during any season), when involved in the process of dense water formation (in some specific places during winter only).

Response: We don't see any contradiction between your point of view and our description. We don't fully understand your comment and we should discuss this more in detail.

***I never said that there was some contradiction but just said that your description should be improved.

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Interactive comment on Ocean Sci. Discuss., 3, 569, 2006.