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Discussions

Interactive comment on "Definitive evidence of the Mediterranean Outflow heterogeneity. Part 1: at the Strait of Gibraltar entrance" *by* Claude Millot

Anonymous Referee #2

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The paper investigates heterogeneity of the deep and intermediate waters just to the east of the main sills of the Gibraltar Strait. It is one part of a trilogy, and I have not read the two other papers, so in some way, I am poorly placed to evaluate how valuable is the effort and whether it brings original scientific results.

The paper presents an analysis of three sets of T and S (and density) vertical profiles in a semi-qualitative and semi-quantitative way. The profiles that originate from open-access databases (except for the data from Hydrochange sensors that are also invoked) are in themselves interesting and could provide some insights on the processes at plays. Most of the profiles (except for one section) are from the southern part of the western ALboran Sea in the vicinity of the sill. A strong emphasis is given to the variety of properties (T, S, more than stratification) in different classes of potential

density corresponding to a range of identified deep and intermediate source waters, modified by mixing either horizontally or vertically.

I have three main concerns: 1/ I have not really understood how the notion of a layer (in particular 'homogeneous' layer), or of an interface is defined ('by eye' or 'qualitatively' is mentioned). Of course this is really difficult in this system with huge variability in mixing, stirring and internal tides, but some framework would be helpful to reach conclusions (and this is 'done' on figures 2, 6, 9 in some way for defining the layers from the vertical density profile).

2/ I got lost by the mix of detailed description of individual profiles (in particular thickness of different layers), without having a clear sense of what the author wants to demonstrate: is it quantifying the spread of properties (and distribution) in the different density ranges, and whether or not these are stratified or less-stratified layers separated with itnerfaces? Is it to convince that these different water masses all take place in the overflow, and thus how? I suspect this last point might be tackled to some extent in the other two parts of the trilogy, but it seems to me that some information on flow/transport is also required that is missing here. If it is more the first objective, clearly more effort should be devoted to synthesize the results. To elaborate a little bit on that, I found figures 4 and 5 fairly synthetic ('the yoyo time series', although I missed there a plot of the layer thickness distributions). Actually, why is this presentation not also continued with the other two data sets?

On the other hand, figures 2,6, 9 which contain a wealth of information, are much too detailed and their presentation lost me. Figure 7 could be considered a synthesis of figure 6. It is however a little difficult to interpret. Figure 8 summarizes the yoyo time series. If I understand it right, most of the deep layer is nearly unstratified (in density), with a very small portion of the water column in interfaces (this could be quantified). It would also be nice to mention how the tidal currents at this site evole in this deep layer (when is there eastward or westward flow?)

3/ the structure and contents are not what is expected of a scientific paper. There are lots of judging comments on other published work or general statements which dont have their place in the manuscript (starting in the introduction). The presentation starts with an interesting figure 1, which is somehwat followed during 2, but not really afterwards (so I wonder how important it is for the paper), until mentioned again in section 6.1.6. The presentation of individual profiles is spred over many pages and with figures 2, 6 and 9. I am wondering whether they could not be summarized in a joint section. Then, the discussion starts with a very long 6.1 entitled: 'Some generally forgotten evidences'. Frankly, I dont think that the assumption should be that we 'readers' have forgotten some rather general considerations on the western Med ocean circulation and processes taking place near Gibraltar Strait. As I stated, maybe 6.1.6 could be summarized and kept. 6.3 deals with what should be done next. I dont think that this has a place in a discussion section. This discussion of what could be done next is indeed continued in part of the conclusion section, which might not be the right place for it.

Alltogether, I feel that the paper should be strongly streamlined (at least, cut by half), and edited to avoid statements that can be interepreted as judgmental or oversimplifying, or not directly related to the work presented. Some of the profile figures could be kept in supplementary material, with a short descriptive presentation of a couple of typical examples and more effort to dscribe synthetically the variety of profile characteristics.

One question: the ranges of density given for the different watermasses is rather narrow: how is it taking care of the low frequency (multidecadal) evolution of deep and intermediate Mediterranean water masses.

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