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Interactive comment on "Thermohaline properties in the Eastern Mediterranean in the last three decades: is the basin returning to the pre-EMT situation?" *by* V. Cardin et al.

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Answers to Referee #1 : 1. The Abstract states that the deep layers of the central Ionian in 2011 carry characteristics that lie between the pre-EMT and the EMT peak values (p 392, l 12). In reality, however, the waters below about 2500 m are warmer and more saline than in 2001 (Roether et al., 2007, Fig. 7f, which should represent the maximum). This shift results from a vertical transfer from layers further up (by action of the new AdDW formation?), so that in the latter layers the properties have in fact moved closer to pre-EMT values. A.The authors thank the reviewer for his/her comments. In fact, the abyssal layer of the central Ionian experienced the effect of a post-EMT phase,

which started approximately in 2003. This phase was characterised by the arrival of newly formed AdDW waters, completely different from the recent past, inasmuch saltier and warmer. This part was corrected in the text. Moreover, the abstract has been substantially modified in the ms in order to report all the changes requested by reviewer #2.

2. The Introduction is too long (see remarks above). Needed are only the LIW and EMDW cells, the EMT basics, the onset of new AdDW formation, and, probably, BiOS, to be followed by "aim of this paper". A. As suggested by the reviewer the introduction part has been shortened.

3. P394, l6: The change in the Aegean was only quite partly of "local origin". Considering that the total release amounted to about twice the total volume of this sea (Roether et al., 2007) and that a good part of it did miss the high densities, it is clear that much water from the outside of the sea was involved. A. The authors thank the referee of his/her comment. Indeed Malanotte.Rizzoli et al (1999) followed by Roether et al. (2007) indicated that the large volumes of dense water formed in the Cretan Sea were the result of high salinity waters primarily imported from outside the Aegean leaving little space for local density forcing. We corrected the text removing "of local origin" from the sentence.

4. P398l17: No errors are given for the ADT data, but I am sure that there are problems. The main feature I note in Fig. 1b is a distinct rise toward the African coast from which I estimate surface geostrophic current speeds of up to 1 m/s, which value is absolutely out of the question. This may be a problem of vicinity to land or of bottom topography, which may be felt also elsewhere. The ADT uncertainties must be briefly explained. – The eddies, which I noted above to be of limited relevance, come out nicely. But I was unable to identify features in the figure that are mentioned in the text further on, for example in p399l16 f. The features in question should be noted explicitly. A. We use the monthly ADT map (referred to April 2011) included in this manuscript (Fig. 1b) only to show the presence of permanent/quasi-permanent features in the Eastern

Mediterranean Sea. Indeed, some of these features (largely discussed in literature) are mentioned in the manuscript (and indicated in the Fig.1b) and their presence helps to explain the thermohaline variability/features shown through the CTD data. Even though we are aware of the possible errors that the ADT data can include, we did not use them to calculate geostrophic velocities and we did not discuss current velocities in our study. In annex we present a short discussion on Synthetic Mean Dynamic Topography (SMDT) error not included, however, in the revised manuscript for the reason explained above. However, we modified the text in order to better justify the use of the ADT map in our work, and we added a sentence specifying that the error of the Synthetic Mean Dynamic Topography in the study area is on the order of 1-3 cm.

5. P401l1: Only the curves of two of the stations are addressed in the text. The inversion at St. 289 seems to indicate a rather shallow outflow. Deep outflow is only indicated at St. 290, but that might be due to Aegean outflow prior to 2011. A more thorough assessment is indicated. A. We added an explanation for the two stations not addressed. Station 289 is located directly in the outflow region of Kasos Strait and is therefore relatively shallow but regarding the outflow the most relevant station. Station 290 is already located in the area of the Hellenic trench, therefore not directly an "outflow station" but however, influenced by the Aegean outflow as explained by Roether et al (2013) and described by Hainbucher et al (2014) for this cruise. We clarified this now in the paper.

6. P402l28 f.: I regard the argument as conjecture. A. This sentence was removed from the text.

7. P403l6, "end of the EMT": Does the EMT only mean change between Adriatic and Aegean, or also changes in the water column, among which the latter are still in bloom?? A. Initially the end of the EMT was considered as the end of the changes experienced by the water column in the Southern Adriatic which is not right. As refered in the ms we can still find the signature of the EMT in the deep layers of the Levantine Sea. However, the 2011 conditions indicates a slow return towards the pre-EMT ones.

The paragraph has been changed in the ms.

P404l3 f.: The Herodotus Trough is the (relatively) deep passage, the blocking occurs from the rest of the Cretan Passage topography. A. The reviewer is right and the authors thanks for his/her comment. After an accurate bathymetry analysis checking where the transect was positioned we agree that the bathymetry feature blocking the circulation is the Eastern Medierranean Ridge and not the Herodotus Trough as suggested. Therefore Herodotus Trough was changed with Eastern Mediterranean Ridge in the ms.

8. P404l15 : see comment #1 above This part was changed in the ms

9. The figures as shown in the OSD file that i received are too small. They should at least be enlarged to fill the full width of the print. The inset maps shown in Figs. 3d, 7, and 8 are far too small. A. Figures in OSD are far smaller than the ones submitted that filled the full width of the print. Nevertheless, we enlarged some of them, specially the inset maps. 10. Fig. 1/caption: The Herodotus Trough must be marked and "Eastern Med Ridge" is distorted in the figure. Caption: M843 is M84/3. – Change "are depicted" to "depicted as the rectangles". – After "are identified" insert " as a to d" A. Suggested changes were done in the text 11. Figs. 2, 3, 4, 5, 7 and 8 show numbers with parts cut off, rectify. It was corrected in the graphs. 12. Fig. 6: The text in p402l17 f. says "front . . . 38.45âŮę N, meant is salinity 38.45. It was corrected in the text. 13. Fig. 7a: M5, not M4. Caption Fig. 7: change to M31/1, M44/4, M51/2 (same in Fig.8, M51/2 not M71) It was corrected in the text. 14. Fig. 9, Caption: "y-axes expanded in . . .". – The vertical lines in Fig. 9c must be explained. Fig. 9c: In the two larger gaps between the vertical lines the curves show variations that are not borne out by the data. – The highly blurred topography in Fig. 9d must be amended. Figure 9 caption has been changed and the inset map in fig.9d has been improved. 15. Fig. 10: Note that the salinity difference between 1987 and 1991 is an artifact due to a salinity calibration error in the 1991 data (cf. Roether et al, 2007, Section 2 and Fig. 3) The authors thank the reviewer for his/her comment.

Technical corrections (to many to list!) A. Thanks for the indication, all of them were corrected in the text and English improvement was performed. 1. P392l2: change “ongoing” to “actual status of the . . .”. –l14: I cannot understand that sentence. – l15: change variability to evolution. 2. P394l2: Change On to During the. – l19: The sentence beginning here is far too long. 3. P396l2: change to The M84/3 and P414 data sets. – l2 ff.: Shorten text appreciably - l15: reword “entrainment”, which means admixing water during flow. 4. P398l22: replace “may” by “can”. – l25, reword to: Temperature and salinity along the quasi- . . . are shown ..” 5. P401l5: replace “out” by “outside”. 6. P403l16: permit one to study .. 7. P405l18 f.: change to: . . . Aegean origin was the principle component . . . 8. P407l13: replace scope by purpose. etc.

Interactive comment on Ocean Sci. Discuss., 11, 391, 2014.