

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.

V. Cardin et al.

vcardin@ogs.trieste.it

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Answers to referee # 2 The authors thank the referee for his/her comments, which have been of great value to improve the manuscript. The aims of the research has been clarified and re-written and dividing them in three main objective (explained hereafter). As suggested by the referee, we considered the interannual variability of the air-sea interaction as heat fluxes and the pre-conditioning in the two main sites of dense water formation AdDW (South Adriatic) and CDW (Cretan Sea). However, in the ms we considered only the period of the cruises analyzed concurrently in the text that is between 1985 and 2011, which characterize different stages of EMT and allow us to place the

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results of the cruise of 2011 (new data) in the context of the long-term variability. A similar analysis for a more extended period would have been out of the scope of our research presented here. However, despite this the authors hope to be able to demonstrate the complexity of the variability of both thermohaline properties in the Eastern Mediterranean and the interaction of these with the various factors that govern it.

1. Section 1 Introduction Line 17-18 page 395 The real aim of this paper isn't "The aim of this paper is to study the evolution of the thermohaline properties of the EM during the last two-three decades.... (this was done in the previous papers, which are almost cited in the manuscript)" but more precisely "is to study..property evolution of the AdDW, the EMDW, and the LIW.....the central Ionian and the central Levantine,...." is crucial in this paper to understand what is real new and what is largely a review of already published papers;

Following the suggestion of the reviewer we changed and re-wrote the aims of the paper in a more appropriate and clear way. The main goals of the ms are: • To present the oceanographic characteristics of the EM during the M84/3 and P414 cruises in 2011 focusing our attention on the properties and pathways of the AdDW, the EMDW, and the LIW. • To put these results in the context of the evolution of the large-scale oceanographic properties and of the circulation during the last three decades. • To discuss the interannual variability of the preconditioning and air-sea interaction (heat fluxes) in the two main dense water source areas for the EM, i.e South Adriatic and Cretan Seas, which are the among of the factors that determine the variability at inter-annual and decadal time-scale.

Line 25-28 page 400: Here there are two very interesting analysis: why the authors don't exploit it with more analysis, for example why we observe and double inversion in the T-S diagram, we have simultaneously more than one Deep Waters, in the same sense both active, one driven by salt and the other one in temperature? And again is the entire water column (until 4000m) involved?

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The referee is right that we have simultaneously more than one Deep Water due to the Aegean Deep Water, which was produced during the EMT and can be still seen in the TS-diagrams. This process was explained by Roether et al (2013) and described by Hainbucher et al (2014) for this cruise. We clarified this now in the paper.

Line 21 to the end of the page 401: This site (south Adriatic) is very important, actually is the site where the source water of the deepest water layers of the Ionian sub-basin is formed, is necessary more discussion, and a figure than include also the temperature (in Fig. 5); moreover why the temperature is so cold at 800 meter and why the authors declare (line 24 same page) that this water don't interact with the LIW, how this water then became warmer? instead I think that here there is a strong mixing and is important that the author make more analysis in this special site;

We agree with the referee in the importance of the southern Adriatic as the main site of water formation of the AdDW. As suggested we extended the analysis of the thermohaline properties for this area in Section 4, where a Hovmuller diagram for the period in analysis shows the long-term variability (Fig. 9 upper panel). We also added the temperature transect in figure 5 as requested. As regard to the low temperature $\theta \approx 13.07$ °C and salinities ≈ 38.73 observed, we believe these values are in line with the water formed recently: the major portion of the Adriatic Deep Water (AdDW) is formed through open ocean convection inside the SAP, while the remaining dense water is formed on the continental shelf of the North and Middle Adriatic; moving southward sinks to the bottom of the Southern Adriatic Pit filling the deepest part of the pit (1000 m depth to the bottom) and displacing the resident warmer and less dense deep water. The AdDW at higher levels (800–1000 m), which has slightly lower density exits through the bottom layer of the Otranto Strait. On its way to the Ionian the AdDW "loose its properties" due to mixing and entrainment getting warmer and saltier. We address the reader in the ms to the papers of Bensi et al. 2013, Manca et al. 2003; Hainbucher et al., 2006 for further indications of the processes taking place.

Line 15 to the end pag.402: Looking the Fig. 6, seem to me that the front of AW is more
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large, grossly speaking from 36N to 40N and the flowing of AW isn't limited only by the anticyclone located at 19E, its work like a sorting point from which the AW splits in two branches: one to east and the other ones to the north, as also the authors explain very well in other part of this manuscript.

Unfortunately during the automatic check of the orthography the sentence " A front ranging from 38.45 to 38.60 (in salinity) was modified to 38.45°N to 38.60°N changing the true meaning of the phrase. The text was modified considering the spatial development of the front instead of the gradient in salinity. We hope that the text is clearer now.

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