

## ***Interactive comment on “Extreme winter 2012 in the Adriatic: an example of climatic effect on the BIOS rhythm” by M. Gačić et al.***

### **Anonymous Referee #2**

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This manuscript relates a reversal of the circulation in the northern Ionian Sea to an especially pronounced dense-water formation in the Adriatic in 2012, which the authors judge as showing a “remarkable sensitivity of Adriatic-Ionian BiOS” (which the authors have dealt with in various previous papers) “on climate forcing”. Absolute Dynamic Topography (ADT) and the related surface geostrophic velocities, Argo profiler and altimetry data, and air-sea heat fluxes were taken into account; subsurface geostrophic currents were obtained from CTD data using the float velocities for referencing. The manuscript is well organized, the figures are helpful to assist the argumentation, the results are convincing, and the literature is adequately covered. However, I note some items that the authors must address.

Specific comment. 1 The introduction makes a lengthy comparison of the Mediter-

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ranean's overturning circulation with that of the global ocean. A more concise argumentation (e. g., Mediterranean first and then what is different from the global ocean) should be chosen. Besides the shallower (subsurface) westward return flow by the LIW, the separate western and eastern deep waters are mentioned. The text suggests that these waters are not involved in the westward return, whereas they are involved, partly directly, and partly by upwelling into the LIW.

2 The sentence beginning p. 429, line 19 (429-19) should be omitted, because the role of salinity has been specified a few lines before. In 429-21 f. the North Ionian Gyre inversions occur "at the same time scales". However they occur in direct relation to the salinity changes mentioned a few lines above, reword.

3 430-12 ff.: I do not understand what the numbers mean. Are these depth intervals over which averaging is applied? Clarify.

4 431-10 ff.: No uncertainties are given for the ADT values. The altimeter part will be ok, but I am pretty sure that the Synthetic Mean Dynamic Topography has a certain error. A hint on this is the fact that the subsurface geostrophic velocities use drifter rather than ADS data as reference. Inspecting Figs. 3 and 4 I have great problems to identify the features that are mentioned in the text (e. g., that the 2008 circulation is anticyclonic is fine, but I am uncertain how the 2011 circulation is judged cyclonic). This is all the more true in Fig. 4. Additional explanation is necessary. It might help to indicate the center trajectory with a pointer in Figs. 3 and 4. How does the sentence in 431-25 f. assess the seasonal influence? Is there any disturbance from Ekman flow?

5 432-27 mentions Fig. 2 (which, in contrast to Figs. 3 and 4, gives me a clear view of cyclonic and anticyclonic circulation). Similar curves are shown later in Fig. 8b, but now positive values indicate cyclonic circulation, which in Fig. 2 is represented by negative values. Unify! Furthermore Fig. 2 ends in about Sept. 2012 whereas Fig. 8b extends up to March 3013. Similar extension in Fig. 2 is desirable. And by the way, taking Fig. 2 literally, the flow in 2012 does not definitely become anticyclonic, but rather

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far less cyclonic; such a signal is however evident in Fig. 8b, please explain. The text says unexpected reversal in 433-17, but a more careful wording may be in order.

6 433-4: The “complete signal” presumably is the weekly average signal and should be denoted that way.

7 In the paragraph beginning 435-8 it is stated that there is a two-layer regime but I cannot find evidence of that in the text. The scatter plots of Fig. 6 indicate that the isopycnals in question all have the same slope relative to the ADT, which in my view means that these isopycnals belong to the same layer. Further down, newly incoming AdDW may enforce a different flow field (more cyclonic, probably). A clarification is needed. Similar in 439-21.

8 438-7: what is the time scale of averaging here?

9 I do not understand the meaning of the sentence beginning in 439-12.

10 Caption Fig. 1: Reference should be made in the caption to the (a), (b), (c) in the figure, and to Fig. 2 when the surface geostrophic flow is mentioned. An indication is needed where the float tracks begin or end.

11 Caption Fig. 5: The time period of the density data should be given in the caption for easier comprehension

12 Fig. 9: I have problems to get a feel for the velocities presented in view of all the scatter.

Technical corrections.

1. 426-2: The Adriatic and Ionian Sea .. -5: anticyclonic... -6: to the extremely .. -15: level was lowered ...

2. 428-9: replace manifested by is manifest

3. 429-9 change to: of Levantine. -16 into consideration

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4. 430-1: an unexpected reversal
5. 431-2: replace detected by found. -8 satellites
6. 432-19 f.: diminish to All profiles used a CTD ..
7. 434-4: add 2012 after December. -6: add (Fig. 8) after March 3013. -10: in terms of an effect. -15 change to: a values reached. -17 change to: a value that was approximately half the average ... -27: move (Fig. 5) two lines up after 2012. -28: replace spread by spreading south.
8. 436-21: independently of. -23: detail not details. -24: evidence not evidences.
9. 437-13: remove period
10. 438-22: ff has wrong font; same in 439-25 and 440-1
11. Reference Bensi et al.: I believe the doi should be 10.1029, please check.

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Interactive comment on Ocean Sci. Discuss., 11, 425, 2014.

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