

Interactive comment on “Changes in the Adriatic oceanographic properties induced by the Eastern Mediterranean Transient” by I. Vilibić et al.

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The analysis presented in this paper is very interesting and represents a further step in understanding the variability in the biogeochemistry of the Adriatic Sea during the past decades. In their introduction, the authors present correctly the BiOS mechanism, and state that the paper aims to “test the relevance of the BiOS mechanism and its impact on the Adriatic Sea” considering the oceanographic dataset collected from 1960 to 2010 at the Palagruza Sill transect.

Whilst the physics of the BiOS seems to be correctly interpreted, the aspect related to the biogeochemical variability in Adriatic needs some revision.

Two distinct and correlated aspects are involved in the BiOS mechanism (Civitarese et

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al., 2010): (i) the different water masses advected into the Adriatic according to the two circulation regimes in the Ionian; (ii) the vertical displacement of the interfaces due to the dynamics of (again) the two circulation regimes in the Ionian.

The first aspect implies that when the Northern Ionian Gyre (NIG) circulation is anti-cyclonic, the Atlantic Water (AW) entering the Ionian from the Sicily Channel is in part deviated northward. This facilitates the advection of AW into the Adriatic through the Otranto Strait. The advection of AW causes the decrease of salinity in the southern Adriatic. When the NIG is cyclonic, the intrusion of AW into the Adriatic is prevented, whilst the advection of saltier water of Levantine/Aegean origin is favoured, causing the increase of salinity in the southern Adriatic.

The second aspect involves the dynamics at the border of the NIG: the anticyclonic circulation regime determines the upwelling of the interfaces; viceversa, the cyclonic circulation causes their downwelling.

Concerning the variability of the thermohaline properties of the water advected into the Adriatic, the contribution of the dynamics (vertical displacement of the interfaces) has presumably a negligible effect in comparison of the presence/absence of AW. On the other hand, nutrients (and related biogeochemical components) are to a major extent affected by the upwelling/downwelling at the border of the NIG. In fact, Civitarese et al. (2010) clearly showed (Fig. 3) the spatial (and temporal) variability of the nutricline depth following the circulation regime of the NIG. In addition, another important interface, the oxygen minimum/nutrient maximum layer (usually located between 800–1200 m depth), is subject the effect of the dynamics. Nutricline depth and nutrient maximum depth contribute together in determining the amount of nutrient advectable over the sill of Otranto (about 800 m) into the Adriatic.

Final remark (see also supplement-Table 1). In conclusion, the advection of different surface (nutrients depleted!) waters in the Adriatic has little or no effect on the amount of nutrient imported, whilst the vertical location of the nutricline and the maximum nutri-

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ent layer determine the nutrient pool in the Southern Adriatic. Therefore, the statement (line 9, p. 928):

"Higher-than-usual nutrient levels, coupled with lower-than-usual temperature, salinity and dissolved oxygen, have been attributed to the intermediate inflow of the nutrient richer Western Mediterranean waters to the Adriatic, entering the Adriatic during the anticyclonic phase of the Bimodal Adriatic-Ionian Oscillation (BiOS)."

is incorrect, also because no intermediate nutrient richer water is advected across the Sicily Channel from the Western Mediterranean, but only surface nutrient depleted water of Atlantic origin (AW).

Analogously, the statement (line 1, p. 942):

". . . we conclude that the Western Mediterranean intermediate water, rich in orthophosphates and TIN when compared to the Eastern Mediterranean waters, were dragged to the Adriatic through anticyclonic circulation in the Northern Ionian Sea."

is incorrect for the same reason.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/9/C150/2012/bgd-9-C150-2012-supplement.pdf>

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