THE STATUS OF DENSE WATER FORMATION IN THE SOUTHERN ADRIATIC SEA IN MAY 2003

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Abstract

Hydrographic observations conducted in May 2003 assess the present status of deep water formation in the southern Adriatic. The observations highlight the importance of the intermediate waters. The highly saline Cretan Intermediate Water is dominating the upper water column, while the Levantine Intermediate Water is displaced to greater depth. Concurrent velocity measurements with an lADCP depict the synoptic flow field and confirm the well-known cyclonic circulation in the Adriatic. The East Adriatic Current is seen as a surface intensified jet, strong currents are also found over the Italian shelf associated with the dense waters from the Northern Adriatic.

Keywords: Adriatic Sea, deep convection, current field

Introduction

Since the start of the Eastern Mediterranean Transient (EMT) the Adriatic has been under scrutiny regarding to her performance as a deep water source. A prime ingredient to maintain deep convection is the presence of highly saline intermediate waters. During most of 1990s the ventilation of the Adriatic Deep water did not occur and only recently in 2002 could the restart of an active renewal be observed [1].

Next to the open ocean convection in the centre of the Southern Adriatic, dense waters formed on the shelves have also been found to be important for the ventilation of the deep layers [2].

Materials and methods

The data presented in this study were collected in early spring 2003 as part of a co-operation between the University of Bremen, Germany and the Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Italy. The field programme in May 2003 comprised hydrographic measurements, current measurements with an lADCP and the recovery of a mooring which had been deployed the previous fall.

Results and discussion

The salinity section across the southern Adriatic (Fig. 1) gives evidence of the still ongoing changes in the Adriatic caused by the EMT [1]. Near the Croatian coast we observed a shallow core of very saline water (S>38.8), which marked the presence of the highly saline Cretan Intermediate Water (CIW). As part of the changes induced by the EMT CIW has been replacing the Levantine Intermediate Water (LIW) in the upper part of the water column. Centred around 400 m depth one observes another salinity maximum in the centre of the gyre (S>38.78) accompanied by enhanced small scale variability in this layer. Compared to the situation in 2002 [1] the salinities and temperatures in this depth horizon (400-600 m) show large increases, which is caused by displacement of the LIW to increasing depth.

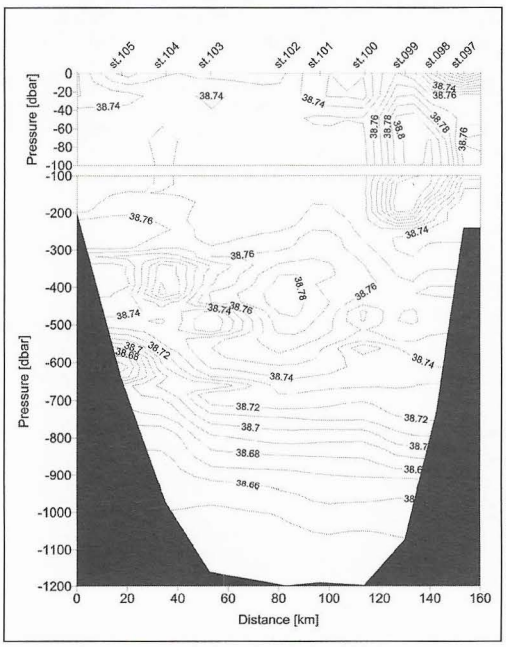

Fig. 1. Vertical distribution of salinity along a section in the southern Adriatic Sea (see inset maps) in May 2003.

An increase of salinity and temperature compared to 2002 is also found in the bottom layer. The 2002 data had indicated an important contribution of dense Northern Adriatic waters to the ventilation of the bottom layers [1]. We did encounter the vein of the dense Northern Adriatic waters on the Italian shelf on all sections with an especially strong signal on the southernmost section. Its density however was not high enough to allow it to sink to the bottom of the Southern Adriatic Pit.

Simultaneous to the hydrographic observations current measurements were performed at each station with an lADCP. This is the first time that a synoptic top to bottom flow field was obtained in the Adriatic. Figure 2 shows the cross section velocity component for the central Adriatic section. In the northern part of the section the north-westward flowing East Adriatic Current is found, which is surface intensified and shows maximum velocities of 16cm/s in the core of the jet. In the southern part of the section the flow seems to be less energetic. The veins of the dense Northern Adriatic waters stand out as cores of higher velocities at the shelf break.

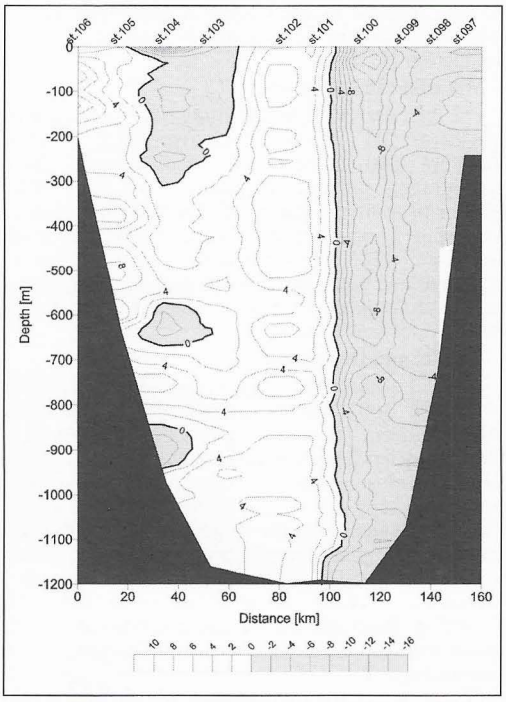

Fig. 2. Vertical distribution of cross section velocity along the same section as in Fig. 1. Positive velocities indicate south-eastward flow, negative velocities are north-westward.

References

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