

Abstract

Deep-sea mooring recording temperature and salinity together with the upward looking Acoustic Doppler Current Profiler (ADCP) located at 300 m depth, was maintained from mid-October 2002 until 8 May 2003. The mooring was situated at a position where presumably an open-ocean convection in the Southern Adriatic takes place. In the pre-conditioning period rather smooth variations of the temperature and salinity were noticed. During the convection period high-frequency variations on the scale of about ten days, were very prominent. These were explained in terms of passage of mesoscale eddies formed along the border of the deep convection patch.

Keywords: Adriatic Sea, Acoustic Doppler Current Profiler record, mesoscale eddies

Introduction

The open-ocean vertical convection has been considered as the most important mechanism in forming the Adriatic Dense Water (AdDW) which then becomes the prevailing component of the Eastern Mediterranean Deep Water (EMDW). This process takes place in the South Adriatic Pit in the centre of the cyclonic gyre (1). The extension of the vertical mixing, which rarely in the last 15 years has reached the bottom layer, varies on the interannual and decadal time-scales in function of the air-sea heat fluxes and the pre-conditioning vertical density structure (2).

Material and Methods

A deep-sea mooring (41°29.7N, 17°42.1E) containing CT sensors at five depths (340, 540, 740, 1000 and 1100 m), an upward looking 300 kHz ADCP at 300 m depth and an Aanderaa current meter at 1124 m was located in the area where presumably the vertical convection takes place. The mooring was maintained in the period between mid-October 2002 and beginning of May 2003 covering the pre-conditioning and deep convection periods. Surface chlorophyll a obtained from the SeaWiFS data is a good indicator of the vertical mixing patch as demonstrated earlier (3), and here it has been used in determining the patch position and its geometry.

Results and Discussion

Low-pass filtered data of the potential density (Fig. 1) show rather smooth temporal variations of the density field in the period from October to December. From the end of December until the end of March the density variations are characterized by the occurrence of several events of sudden density decrease of the duration of about a week. These density variations are associated with the occurrence of the saltier and warmer water at the mooring site. The amplitude maximum of these events occurs at a depth of about 700 m. The vertical stratification variation is negligible during the entire studied period demonstrating that, at least at the mooring site, the vertical convection did not take place. Conversely, XBT surveys carried out on a monthly basis in the area during the same winter do show that the vertical convection took place in the Southern Adriatic area and reached the horizon of about 600 m. The only possible explanation for the lack of the vertical convection signal at the mooring site is that it was located out of the vertically mixed patch. Indeed from the SeaWiFS chlorophyll a horizontal distribution (Fig. 2) it is evident that the mooring was positioned northward of the high-chlorophyll patch. Presumably the high surface chlorophyll content corresponds to the vertically mixed patch since in that area the nutrients available for phytoplankton have much higher concentrations being brought to the surface by the vertical mixing. Furthermore, the events of strong density variations can be explained in terms of passages of mesoscale eddies formed along the rim current of the patch as evident from the chlorophyll distribution. These eddies are responsible for the water properties advection and re-distribution from the patch into the rest of the basin and have length scales of several tenths of kilometre.

Acknowledgments. We thank Elena Mauri for processing-producing the SeaWiFS image and Isaac Mancero-Mosquera for the help in processing-drawing the data.

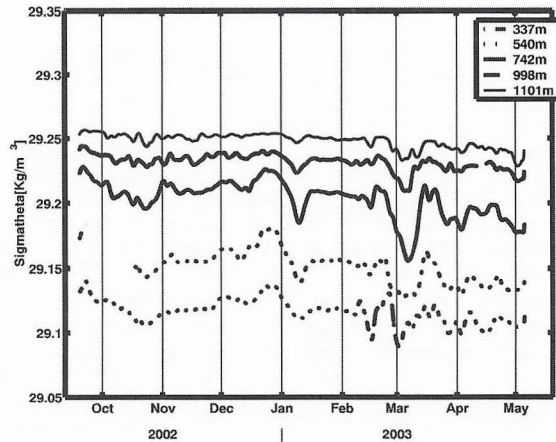


Fig. 1. Time-series of potential density at five measurement depths.

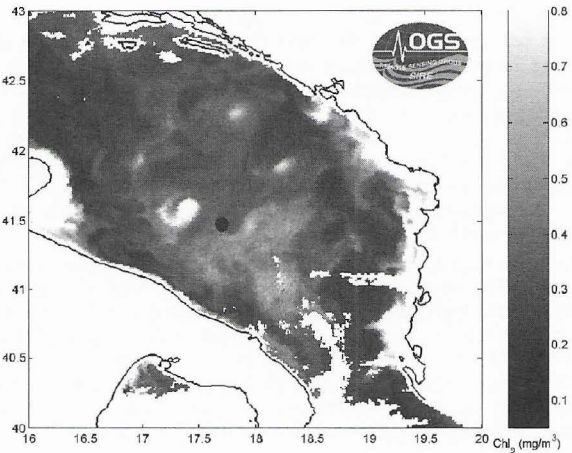


Fig. 2. Horizontal distribution of the surface chlorophyll a concentration (SeaWiFS data) for 16 April 2003. The mooring site is denoted by a thick dot.

References

- 1 - Gacic M., Lascaratos A., Manca B.B. and Mantziafou A., 2001. Adriatic deep water formation and interaction with the Eastern Mediterranean Sea Pp.111-142. In: Physical Oceanography of the Adriatic Sea, B. Cushman-Roisin *et al.* (eds.), Kluwer Academic Publishers.
- 2 - Cardin, V. and Gacic M., 2003. Long-term heat flux variability and winter convection in the Adriatic Sea. *J. Geophys. Res.*, 108, C9: 8103.
- 3 - Gacic, M., Civitarese G., Cardin V., Crise A., Miserocchi S. and Mauri E., 2002. The open-ocean convection in the Southern Adriatic: a controlling mechanism of the spring phytoplankton bloom. *Cont. Shelf Res.*, 22, 14: 1897-1908.