WATER MASSES INFLUENCING THE HYDROGRAPHIC PROPERTIES OF SAROS BAY

Erdal Tokat * and Erdem Sayin
Dokuz Eylül University, Institute of Marine Sciences and Technology Bakü Blv. No:100 Inciralti/Izmir, Turkey - erdal_tokat@yahoo.com

Abstract
The water properties of the Saros bay are investigated considering the influences of several water masses: The warm and highly saline Levantine waters (LSW and LIW), the cold and fresh Black Sea Water (BSW), and the intermittently formed cold and dense upwelling water off the northern coast of Gelibolu Peninsula. The analysis was made using cruise data collected between 1991 to 2004. The Levantine waters were observed especially in spring periods, and penetrate into the Saros bay, influencing the water column from 40 m to 350 m. All water masses, including North Aegean Deep Water (NAeDW) were compared with each other in time and space.
Keywords : Aegean Sea, Upwelling.

Saros bay is situated at the northern coast of the Gelibolu Peninsula in the North Aegean Sea. The bay is roughly "V" shaped; its length is about 61 km, and the width that connects it to Lemnos basin (Aegean Sea) is about 36 km long, reaching a depth of 700 m. Saros bay is under the influence of northerly winds most of the year. Northeast wind affects the northern coastal area of Gelibolu Peninsula, and cold and dense water can be observed as a result of upwelling processes taking place in the area.

In order to examine the physical features of Saros bay, CTD data sets obtained from expeditions between 1991 to 2004, and hourly wind data from Gökçeada Meteorological Centre between 1991-2001, were studied. A numerical model (Killworth's Ocean Model) was used to calculate the general circulation patterns of Saros bay.

Four types of water masses can be determined in the bay: 1) LWs (Levantine waters, LSW, Levantine Surface Water and LIW, Levantine Intermediate Water), 2) BSW (Black Sea Water), 3) NAeDW (North Aegean Deep Water), and 4) SBSW (Saros Bay Surface Water). Although the bay is widely open to the North Aegean Sea, the water exchange between Saros bay and the open basin is limited. The renewal time, which was calculated using Killworth numerical model, is approximately more than 10 years because of the currents weakness.

Physical properties of the SBSW are mainly affected by the pronouncedly blowing northerly Etesian winds that cause upwelling over Saros bay. Upwelling frequently occurs along the northern coast of Gelibolu Peninsula and brings cold and dense water to the surface. Therefore, a distinguishable surface water (SBSW) is formed with characteristics different (colder and saltier) from the North Aegean Surface Water (NAeSW). Surface water temperature in the upwelling area is 1 or 2 °C lower than the temperature of surrounding waters.

BSW is characterized by its very low salinity compared to Aegean Sea waters. BSW was detected by its low salinity (36.12) and temperature (13.25 °C) values in the Saros bay surface layer in winter 2002.

The relatively warmer and more saline waters of Levantine origin propagate northwards along the Eastern Aegean, encounter the less saline and colder BSW over the Lemnos plateau, and form a strong permanent thermohaline front [1, 2]. The Levantine water masses can be determined in the intermediate layer by their relatively higher salt and heat content in the North Aegean Sea [3]. Vertical temperature profiles measured during the spring cruises of R/V Piri Reis in Saros bay show that the intermediate layer is filled by warm LWs that occasionally enter the bay. In addition, the effect of LWs can be determined from winter and spring T-S diagrams with their specific water characteristics down to a depth of 350 m. In the profiles obtained in spring 2001, LWs are observed between 50 m and 200 m with salinity of 38.7 and temperature of 14.9 °C (Figure 1).

The deep layers of the North Aegean Sea are occupied by very dense waters with density values greater than 29.40 [4]. According to their characteristics, these waters should have their origininside the Northern Aegean.We concluded that the physical properties of Saros deep water are not affected by seasonal changes, and their values are nearly constant having similar characteristics to NAeDW. Typical water properties of the deep water under the depth of 500 m are as follows: 13.4 °C, 38.9 psu and 29.4 kg/m^3.

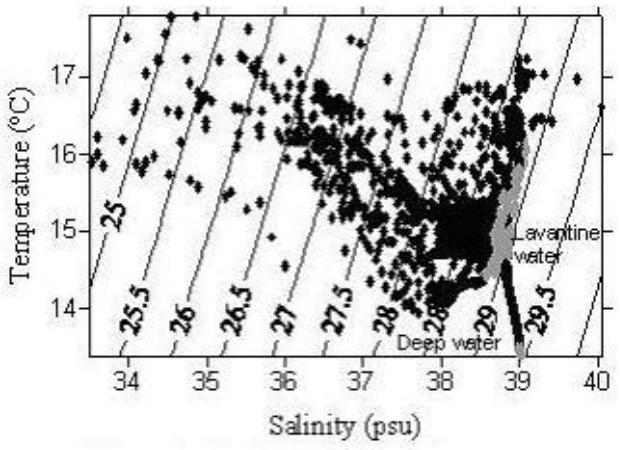

Fig. 1. Spring 2001 T-S diagram

References
1 - Theocharis A. and Georgopoulos D., 1993. Densewater formation over the Samothraki and Lemnos plateaux in the north Aegean Sea (eastern Mediterranean Sea). *Cont. Shelf Res.,* 13 (8-9): 919-939.
2 - Theocharis A., Georgopoulos D., Lascaratos A. andNittis K., 1993. Water masses and circulation in the central region of theEastern Mediterranean: Eastern Ionian, South Aegean and Northwest Levantine, 1986-1987 . *Deep-Sea Res. II*, 40 (6): 1121-1142.
3 - Korres G., Laskaratos A. and Hatziapostolou E., 2002. Towards an oceanforecasting system for the Aegean Sea. *Global Atmos. Ocean Syst.*, 8 (2-3): 173-200.
4 - Lacombe H., Tchernia P. and Benoist G., 1958. Contribution ï£¡ l'étude de la Mer Egée en période d'été. *Bulletin d'Information du Comité Central d'Océanographie et d'Étude des Côtes,* 8: 454-468.