CURRENT OBSERVATIONS IN THE BOSPHORUS STRAIT DURING EPOS

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Abstract

Pairs of acoustic Doppler current profilers (ADCPs) were deployed at each end of the Bosphorus and Dardanelles Straits as part of the United States Naval Research Laboratory's Exchange Processes in Ocean Straits (EPOS) project. All 8 current moorings were deployed in September 2008 and remained in place for about half a year in the Bosphorus and for one year in the Dardanelles. This is the first time that comprehensive current measurements coincident to both straits over seasonal time scales have been made. An overview of the current structure and variability is given here for the Bosphorus Strait to provide insight into the complexity of the TSS dynamics.

Keywords: Bosphorus, Currents

The Turkish Straits System (TSS; Figure 1) consists of the Bosphorus Strait, Sea of Marmara, and Dardanelles Strait and is the only connection between the Black and Mediterranean Seas [1]. The main objective of EPOS is to understand the synoptic variability of the exchange flows in the TSS by study of the currents, temperature, salinity, and microstructure. In close collaboration with the Turkish Navy Office of Navigation, Hydrography and Oceanography and the NATO Undersea Research Center (NURC), the R/V Alliance was used for the mooring work and data collection. The ADCPs were housed in trawl-resistant moorings referred to as Barnys (Figure 2). The nearly full water-column current profiles are used to describe the vertical current structure and the seasonal variability of the two-layer current system in the straits, with focus here on the Bosphorus Strait.

Considerable differences in average flows, current variability, and layer thicknesses were found. Layer interfaces ranged from about 15 to 40 m depth in the Bosphorus Strait while integral time scales for the along strait current components were 6-9 days and maximum observed currents were 231 cm/s. While largest current speeds were observed in the upper layer at the southern end of the Bosphorus, largest speeds were observed in the lower layer at the northern end of the strait. Greatest range in velocity was at the southern end where the currents ranged from -231 to +115 cm/s. Depth dependent processes dominated and were relatively strong in the Bosphorus. Dynamical processes were very different between the ends of the strait. Numerous current reversals were found in the top layer and interestingly can be predicted from the integrated wind stress. We expect that results from this experiment will enhance our understanding of the dynamics in the TSS and will lead to additional field and modeling efforts.

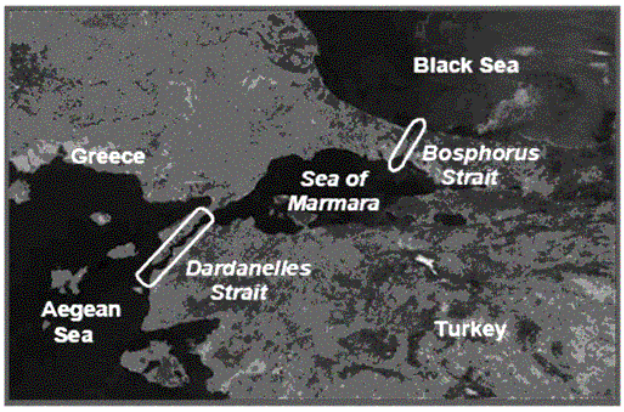

Fig. 1. Turkish Straits System (TSS)

Fig. 2. Shown here is a view of a Barny platform on the sea floor. The ADCP is contained in the Barny and is located at the top. An outer ring of reinforced cement provides impact resistance and ballast. The overall smooth profile minimizes the risk of being fouled by fishing gear and makes the Barny highly resistant to trawling. The entire mooring is recovered at the end of the deployment via acoustic release of a pop-up float that carries a recovery line and the ADCP to the surface.

References

1 - Latif M.A., Özsoy E., Oguz T. and Ünlüata Ü., 1991. Observations of the Mediterranean inflow into the Black Sea. *Deep-Sea Res.*, 38 (Suppl. 2): S711–S723.