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Current Observations in the Turkish Straits during EPOS

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The Turkish Straits System (TSS) consists of the Bosphorus Strait, Sea of Marmara, and Dardanelles Strait and is the only connection between the Black and Mediterranean Seas. 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. 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. Eight 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. Nearly full water-column current profiles are used to describe the vertical current structure and the seasonal variability of the two-layer current system. Considerable differences in average flows, current variability, and layer thicknesses were found in both straits. Layer interfaces ranged from about 10 to 20 m depth in the Dardanelles and from 15 to 40 m depth in the Bosphorus. Integral time scales for the along strait current components were 2-4 days for the Dardanelles and 6-9 days for the Bosphorus. Maximum observed currents were 122 cm/s in the Dardanelles and 231 cm/s in the Bosphorus. Largest speeds were observed in the upper layer except for the northern end of the Bosphorus. Greatest range in velocity was at the southern end of the Bosphorus where the currents ranged from -231 to +115 cm/s. Depth dependent processes dominated both straits and were stronger in the Bosphorus. Dynamical processes appeared similar at both ends of the Dardanelles but dynamics were very different between the ends of the Bosphorus, and quite different between the two straits. 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. This is the first time that comprehensive current measurements coincident to both straits over seasonal time scales have been made.