Geophysical Research Abstracts
Vol. 12, EGU2010-5158, 2010
EGU General Assembly 2010

Volum Fluxes in the Dardanelles Strait

Ewa Jarosz (1), William J. Teague (1), Jeffrey W. Book (1), Sukru Besiktepe (2), Miktat Kadioglu (3), Mark Hulbert (1), and Andrew Quaid (1)

(1) Naval Research Laboratory, Oceanography Division, Stennis Space Center, United States (ewa.jarosz@nrlssc.navy.mil), (2) NATO Undersea Research Center, La Spezia, Italy, (3) Istanbul Technical University, Istanbul, Turkey

The Dardanelles (Çanakkale) Strait is a part of the Turkish Straits System (TSS) that also includes the Sea of Marmara and further towards the north the Bosphorus (Istanbul) Strait. The TSS is the only connection between the Black and Aegean/Mediterranean Seas, and plays a paramount role in water mass exchange between these basins. It has been established for centuries that due to the density contrast in the Black and Aegean basins, the basic exchange flow in the Dardanelles Strait is characterized by Black Sea brackish waters flowing southward in a surface layer, and salty waters from the Aegean Sea moving northward below.

The United States Naval Research Laboratory (NRL) and the NATO Undersea Research Center (NURC) in collaboration with the Turkish Navy Office of Navigation, Hydrography and Oceanography deployed two mooring sections (Aegean Sea and Marmara Sea entrances) in the Dardanelles Strait in September 2008 as a part of the TSS08 (NURC project) and NRL's "Exchange Processes in Ocean Straits" (EPOS) project. Each section was configured with two trawl-resistant bottom (BARNY) moorings (containing an acoustic Doppler current profiler, wave/tide gauge, and temperature/conductivity sensors) and one line mooring equipped with seven pressure, temperature, and conductivity sensors. All moorings were recovered and re-deployed in February 2009. The final recovery of the moorings occurred in October 2009. All moorings returned almost a 14-month long time series of high quality data.

The available observations were then used to estimate annual, seasonal, monthly, and instantaneous (40-hour low-passed data) volume fluxes in the upper and lower layers in the Dardanelles Strait. On seasonal and monthly time scales, the maximum transport in the upper layer was observed in winter/spring and the minimum was observed in summer/fall. The lower layer transport was reversed, i.e., at the maximum in summer/fall and at the minimum in winter/spring. However, the largest fluctuations, as expected, were present in the instantaneous volume fluxes. These fluctuations were very distinct in the upper and lower layers, and could be twice as large as their respective annual, seasonal, and monthly mean values. Results from multiple and partial coherence analyses indicate that the variability of the upper-layer transport is coherent with the water-level differences between the Aegean and Marmara Seas, and is secondarily coherent with the local atmospheric forcing (along-strait wind, cross-strait wind, and the atmospheric pressure). Variability of the volume flux in the lower layer is highly coherent with the water level differences that can easily account for at least 50% of the variance of the transport fluctuations.