

EXCHANGE FLOWS THROUGH THE BOSPHOROUS AND THE DARDANELLES STRAITS

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ABSTRACT

The exchange flows through the Bosphorus and the Dardanelles play important roles in the oceanography of the Mediterranean and Black seas. The fresher Black Sea water is introduced into the Mediterranean through the upper layer flow after traversing the Marmara and the Aegean seas, while water of Mediterranean origin enters the Black Sea through the lower lay flow of the two straits.

Estimates of the annual average transports, based on long term salinity measurements, are $\sim 600 \text{ km}^3/\text{yr}$ and $\sim 300 \text{ km}^3/\text{yr}$ for the upper and the lower layer for the Bosphorus at the Black Sea junction, and $\sim 1200 \text{ km}^3/\text{yr}$ and $900 \text{ km}^3/\text{yr}$ for the Dardanelles- Aegean junction. Measurements of volume fluxes conducted between 1991-1998, using a vessel mounted ADCP, show that the flows are highly variable, responding to changes in meteorological conditions over the adjacent basins on time scales as short as a few hours.

The maximum flows in the Bosphorus were $\sim 50,000 \text{ m}^3/\text{sec}$ for the upper layer and $\sim 15,000 \text{ m}^3/\text{sec}$ for the lower layer. The minimum for either layer was zero, indicating a temporary blockage due to adverse winds. However, the average measured fluxes are roughly in agreement with the steady flux estimates. Calculation of the Froude number using a 3-layer approximation of the flow, it was determined that hydraulic controls exist at the southern exit, the northern sill and in the contraction near Kandilli in the Bosphorus, and at the southern exit and the Nara Pass in the Dardanelles.

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ABSTRACTS

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