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Transport estimates at the western section of the Strait of Gibraltar

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Three-year long time series of Acoustic Doppler Current Profiler observations, at a single station in Espartel Sill (Strait of Gibraltar), have been used to compute a mean outflow of Q2 = - 0.82 Sv through the south, main channel of the westernmost gateway for the Mediterranean Water. The most intense fluctuation of this flow is at semi-diurnal frequency linked to tides. Other less important but non-negligible source of variability of the mean flow is the meteorological forcing that induces fluctuations in the subinertial band (in the range of few days up to few weeks of period), and the seasonal and inter-annual variations. This makes the direct estimation of transports a difficult task.

Tidal currents hamper the clear identification of the two-layer exchange through the main channel of the Espartel Section during some part of the tidal cycle. They promote peaks exceeding -2.5 Sv during flood (westward moving) tide, when the entire water column moves towards the Atlantic Ocean, but are not strong enough to reverse the outflow during the ebb (eastward moving) tide. As a result, the two-layer character of the flow emerges. Furthermore, the contribution of eddy fluxes (positive correlations of tidal currents and tidally-induced vertical displacements of the interface) over Espartel Sill to the outflow is less than 5% becoming noticeable only in spring tides. This makes the Espartel Section be the most suitable place for outflow monitoring.