

Ten years of marine current observations in Espartel Sill, Strait of Gibraltar

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Almost ten years of Acoustic Doppler Current Profiler (ADCP) observations of the outflowing currents in the southern channel of the Espartel Sill in the Strait of Gibraltar have been analyzed to make a long term estimation of the Mediterranean outflow through that section. A total of 25 moorings have been deployed from September 2004 to April 2014 nearly continuously, with a one-year break in August 2011, due to a temporary change of the mooring location in the Camarinal Sill, and few sporadic gaps in January 2009 and January 2011 due to the partial loss of the line. All data sets have been submitted to a careful quality control in order to address issues related to the coherence of the measured data, with the aim to check the inter-comparability of the different time series. A slightly different configuration set has been used throughout the years in order to test the robustness of the measurement and the good homogeneity of the whole dataset has been verified. Tilt range of variation and horizontal velocity error based on a statistical estimate of the ensemble standard deviation have been carefully assessed and the latter has been used to filter the residual spikes mostly concentrated in the upper bins of the vertical profiles. The missing mooring has been reconstructed by inferring velocities from a parallel mooring deployed contemporarily in Camarinal Sill and Espartel Sill, basing on a combination of subinertial correlation with atmospheric forcing and the reconstruction of the tidal dynamics by harmonic analysis. Finally a three-dimensional high resolution numerical model, widely validated over the area of interest, has been used to aid the assessment of the possible overestimation of the flow by the ADCP observations through the entire section of the Espartel Sill and the reconstruction of the missing mooring in 2011.