

Flow through the Strait of Gibraltar

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A major change in the understanding of the dynamics of flow through straits has occurred over the last few years due to the development of two-layer hydraulic control models and due to new observations of the exchange between the Atlantic and Mediterranean through the Strait of Gibraltar. From the theoretical models, predictions of the outflow of Mediterranean water, the inflow of Atlantic water and the salinity difference between the two water masses can be made for the specific configuration of the Strait of as a function of the net evaporation over the Mediterranean basin. Time series current and salinity observations on the Gibraltar sill during the 1985-86 Gibraltar Experiment determine the actual outflow, inflow, outflow salinity transport, and salinity difference. The observed outflow salinity transport provides a nearly direct estimate for the net evaporation over the Mediterranean basin of 52 cm/yr, that may be more accurate than the usual climatological estimates. The observed inflow is 0.68 Sv and the best estimate of the outflow is 0.72 Sv, with a salinity difference of 2.2 ppt between the inflowing and outflowing waters. For such a net evaporation, predictions of the inflow and outflow transports and the salinity difference between them from hydraulic theory are in reasonable agreement with the observed values, though the theoretical predictions for the transports are about 20% larger than the observed values. Given that present theory does not include important dynamical effects such as rotation and friction that could lower the predicted exchange, the agreement within 20% between the observed and predicted exchanges through the Strait of Gibraltar is encouraging.