Abstract View

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A Study of Velocity Profiles Through the Main Thermocline

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ABSTRACT

A time series of velocity profiles derived from three methods are used to describe the variations of current in time and in the vertical. Absolute velocity profiles were Obtained by acoustically tracking a falling probe; relative profiles were derived from motional electric fields (EM method) measured by a second free-fall instrument and from density observations using the dynamic method.

The two free-fall profile methods agree within 0.01 m s^{-1} rms averaged over depth intervals in which the observations were separated in time by less than 10 min. Although the rms differences between profiles increases to about 0.02 m s^{-1}, due to the fact that one device falls at one-third the speed of the other, the agreement between methods was sufficiently good that the eight acoustic profiles and six EM profiles were combined to yield a time series lasting 4 days. These profiles, taken near Bermuda In May 1971, were divided into two sets having a mean time separation of 2 days. Each set of profiles was fitted to a time-mean or steady profile and a rotary component of inertial frequency. Using lagged correlation and vector spectral analysis, it is shown that the inertial energy propagates downward at a group velocity having a vertical component of about 0.5 mm s^{-1}. These results suggest a surface or near-surface energy source and a lack of modal structure to the inertial currents. The steady component agrees within 0.02 m s^{-1} rms with the geostrophic profile computed every 200 m and both have the same shear over the interval 200–1200 m.