Abstract View

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Velocity Structure in the Mixed Layer during MILDEX

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ABSTRACT

During October–November 1983, a MIxed Layer Dynamics EXperiment (MILDEX) took place off the coast of California. As a part of MILDEX, a number of sensors were deployed from the Research Platform FLIP in an effort to monitor the flow structure in the near-surface mixed layer.

Profiling current meters (VMCMs) measured velocities down to 150 m on an hourly basis. Other VMVMs were set at fixed depths. Depths of interest were examined using a package which measured three-component velocities and displayed them in FLIP's laboratory in real time. The current meters often observed sequences of downwind-directed jets, with maximum velocities exceeding 25 cm s^{-1}. Downwelling velocities of equal magnitude were also observed. The strongest currents were found 10 to 35 m below the surface, at mid-depth in the mixed layer. Surface convergences associated with these jets were visualized by scattering tracers (computer cards) on the sea surface. These features suggest Langmuir circulation.

Six Doppler sonars were mounted on FLIP's hull. One was directed such that the beam grazed the sea surface. Surface velocities were measured in the crosswind direction over 600 to 1400 m from FLIP. During a period of strong Langmuir circulation, the sonar detected crosswind surface convergences at scales up to about 3 times the mixed layer depth. This ratio of maximum spacing to mixed layer depth stayed roughly constant as the mixed layer depth varied from 40 to 60 m. Peak convergences were of order ±0.003 s^{-1} at the largest scales. The features moved with the mixed layer, and persisted for up to 2 hours each. FLIP moved about 2 km straight downwind relative to the mixed layer in this time; thus, the features were about 2 km long (or more), and roughly parallel to the wind. This scenario is supported by data from a second sonar which measured the downwind component of the lower mixed-layer flows out to about 800 m downwind of FLIP.

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