Observations of Langmuir Circulation and Internal Waves

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Abstract: Sequences of surface velocity and backscatter intensity measurements were obtained with a 50 kHz multi-beam acoustic Doppler system. The 32 element array yields resolutions of roughly 10 m in range by 1.5° bearing, sampling every 2.5 s. Data were obtained in conjunction with the Hawaiian Ocean Mixing Experiment (HOME), and includes well-resolved samples of both high-frequency internal waves and Langmuir circulation. The former are associated with the strong internal tides generated over the Hawaiian mid-ocean ridge, while the latter are driven by the trades and/or storm winds, together with the complex directional wave field. Surface waves are also resolved (for periods longer than 5 seconds), typically revealing several discrete directional "modes." In addition, rapid-profiling CTDs and a combined up/down-looking sonar ("deep-8 sonar") are used to describe the profiles of density and velocity associated with the internal wave field. The data are used to investigate interactions between Langmuir circulation in the mixed layer and the underlying internal wave field. In particular, the hypothesis that the internal waves can disrupt the Langmuir circulation is examined.

0-933957-30-0