THE BOTTOM BOUNDARY LAYER OVER THE FLANKS OF THE HAWAIIAN RIDGE

J. Aucan, M. Merrifield, D. Luther
Dep. of Oceanography, University of Hawaii, (jerome@hawaii.edu)

Moored current meter and temperature observations and ADCP/CTD repeat profiles are used to describe the structure and variability of the bottom boundary layer over the deep flanks of the Kaena Ridge as part of the Hawaii Ocean Mixing Experiment (HOME). Current and temperature fluctuations within 100m of the bottom in 2500m water depth are dominated by semidiurnal tidal variability. Typical semidiurnal current speeds are 0.10-0.12 m/s and vertical displacements, inferred from temperature fluctuations, are the order of 400 m. The semidiurnal variability appears to be associated with both the barotropic and baroclinic components of the tide, with the baroclinic tide in the form of downward propagating beams that originate near the ridge crest at 1000m water depth. The propagation angle of the dominant M2 tidal beam is similar to the slope of the ridge, allowing the beam to remain in proximity to the ridge flank. As a result, a tidally-driven frictional boundary layer of approximately 80-100 m thickness is established over much of the ridge slope. Estimates of Reynold’s stress, Thorpe scales, and log layer frictional velocities within the boundary layer yield dissipation and eddy diffusivity values that are 3 orders of magnitude higher than background values away from the ridge. The contribution of near boundary dissipation to the regional tidal energy budget will be addressed.