

Existing high resolution regional models typically resolve the mean vertical structure of the upper ocean boundary layer. Physically-based parameterizations of vertical fluxes make it possible to account for subgrid mixing at length scales smaller than the layer depth, but no specialized parameterization is used to represent the dynamics of horizontal mixing below the  $O(1)km - O(10)km$  resolution scale. We aim to determine the physical limitations of subgrid parameterization on these scales. We anticipate that existing parameterizations will fail in regions of strong lateral variability (as commonly found in the coastal ocean) as the dynamics become fully three-dimensional.

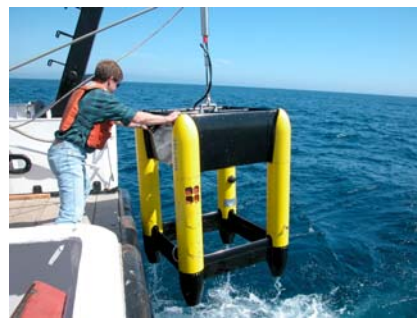
An adaptive measurement program will employ neutrally buoyant Lagrangian floats and a towed profiler to conduct synoptic, three-dimensional surveys in the drifting reference frame defined by the float array. Measurements will characterize boundary layer turbulence and facilitate detailed separation of vertical and horizontal processes.

We plan to focus sampling on the Kuroshio extension, in the region east of Honshu. Remotely sensed sea surface temperature and ocean color will guide us to strong fronts and eddies associated with the Kuroshio extension. Lagrangian floats will be deployed into these features, after which we will conduct towed profiler surveys following the drift track. Surveys duration will be 1 – 4 days, with multiple deployments over the duration of the cruise.

Sampling will employ Lagrangian floats built at APL/UW, a proven tool for measuring turbulence in the upper ocean mixed layer. The floats (image on right) consist of an approximately meter-long cylinder whose volume, mass and compressibility are tuned to nearly match those of seawater and an approximately  $1 m^2$  horizontal drogue which adds additional drag in the vertical. The float can control its buoyancy by extruding a cylinder in and out of the bottom endcap and thus maintain its density closely matched to that of seawater. This, plus the drag, causes it to accurately follow Lagrangian water parcel trajectories in a turbulent boundary layer. These floats can carry a variety of sensors. For the proposed work, they will measure temperature, pressure and salinity, surface wave spectra, and acoustically tracked position.



The Triaxus towed profiler will provide quasi-synoptic, three-dimensional surveys of the upper ocean to quantify horizontal variability at kilometer scales and facilitate estimation of lateral fluxes. Triaxus can profile at tow speeds ranging from 4 – 10 knots, depending on the desired depth range and the amount of cable deployed. The vehicle can achieve 0 – 380 m profiling range using an unfaired electro-optical tow cable. Horizontal resolution depends on profile depth and tow speed. For this application, we anticipate towing at 8 knots (and will attempt to achieve 10 knots) while sampling at 1 km scales. Sensors include upward (1200 kHz) and



downward (300kHz) ADCPs, redundant, pumped Seabird T-C sensors, dissolved oxygen, a 25 cm path length transmissometer and chlorophyll and DOM fluorometers