Coordinated surveys using Slocum gliders and free-floating drifters for tracking frontal features.

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Abstract (Oral Presentation)

The study of small-scale (< 20 km) features which are constantly present at ocean fronts has shed light on the role fronts play in the production of new water mass and the overall transport of momentum, heat, and salt across ocean basins. High-resolution measurements and constant surveillance are necessary to measure the highly intermittent processes that can create these small-scale features. One example of these small-scale features is thermohaline interleaving observed at the edge of the front form when the Kuroshio current intrudes into the South China Sea. Using ship- and glider-based observations of temperature, salinity, currents, shear, and turbulent microstructure, we described the lateral and vertical structure of the front observed during the 2014 winter monsoon season. We deployed a coordinated array of three Slocum gliders following a free-floating drift to sample the complex temperature-salinity structure at the boundary of the intruding Kuroshio current. These drifts lasted from 0.7 to 2.9 days, and the location of the deployment was chosen according to sea surface temperature satellite data and flow-through temperature and salinity surface data. The goal of this study was to resolve fine-scale variability of interleaving features at the front and to investigate how these features enable mixing between the two distinct water masses. The coordinated-array survey created a data set that had ample examples of thermohaline interleavings which permitted us to identify the lateral scales in relation to the observed front. We observed that these interleavings were potentially unstable to Oral double diffusion and shear instabilities. Complications and challenges associated with these types of surveys include, but are not limited to, piloting several gliders at the same time, the deployment and recovery of several assets in short period, and flying the gliders through large currents. However, collaboration across institutions with glider expertise and the availability of real-time data from satellite images and ship-based data made this survey possible.