Northern Survey Area

The northern site was surveyed using Scanfish from west to east, immediately upon completion, the same track was occupied in the opposite direction by the VPR towfish. These two components of the survey together took approximately 16 hours. The chlorophyll structure in the area was complex (Fig. 3). The chlorophyll maximum layer deepened sharply offshore, bifurcating into two well-separated peaks at the eastern end of the domain. The distribution was largely similar during both occupations, but some onshore motion of chlorophyll is apparent in the western portion of the survey area. The prevailing current in the upper 100 m (Fig. 4) was eastward.

Size Structure

Many of the features apparent in the chlorophyll fluorescence measurements are also visible in the LOPC observations (Fig 5). Several high-chlorophyll patches correspond to regions with high concentrations of small (< 0.5 mm) particles. However, the thin, warm, high-chlorophyll layer toward the eastern edge of the survey area (the upper of two maxima in the chlorophyll profile) is coincident with a higher concentration of larger particles. A large dense patch of small particles at a depth of 75 m observed in the northeastern corner of the domain is not apparent in the chlorophyll field. Future analysis of the VPR data from the repeat occupation will likely distinguish between the organisms responsible for these signatures. Localized patches of small particles notwithstanding, the proportion of larger particle sizes increases offshore (Fig. 6).

Acknowledgements, etc.

This research has been supported by KAUST. Additional contributors to this work include Melissa Patrician, Yasser Kattan, Waring Partridge, and Haitham Al Jahdali. As the data has only just been collected, all results should be considered preliminary.

High-Resolution Physical-Biological Surveys in the Caribbean Sea


email: bhodges@whoi.edu

Cruise Overview

From December 1 to 10, 2008, a program of high-resolution physical, optical, and biological sampling was carried out from the R/V Okeanos. Originally planned as an exploration of the physical and biological variability off the Saudi Arabian Red Sea coast, the study area was relocated to the Caribbean Sea, and the primary surveys were conducted in the waters of the U.S. Virgin Islands (Fig. 1). Accordion-type survey patterns were completed just offshore of the coral reefs to the south of St. Thomas, and just offshore of the prehistoric reefs to the north of the island. These observations form part of an ongoing effort to investigate the mechanisms responsible for the exchange of fauna between the coral reef environment and the open ocean.

CTD casts and net tows were carried out at stations distributed throughout the study area, but the primary method of investigation was towing two robotic profiling platforms: the Scanfish and the VPR towfish (Fig. 2). Both platforms were equipped with CTDs and chlorophyll fluorometers. Scanfish also measured turbidity and dissolved oxygen.

Both platforms also included state-of-the-art optical plankton counting instruments. The Laser Optical Plankton Counter (LOPC) mounted on the Scanfish resolves particles into size classes ranging from 0.1 mm to 2 mm in 15-micron increments, and records the outline of larger particles up to 3.5 cm. The Video Plankton Recorder (VPR) on the second instrument platform photographs and automatically categorizes plankton on the basis of their shapes.

Figure 2: Robotic profiling towfish on the deck of the R/V Okeanos. Scanfish, foreground, with LOPC mounted on top. VPR towfish, background.

Figure 3: Chlorophyll concentration (arbitrary units) along the towfish tracks in the northern survey area. Top: Scanfish survey; bottom: VPR towfish survey, done immediately afterward.

Figure 4: Current, vertically averaged over the upper 100 m during the occupation of the northern survey area. Data from 150 kHz shipboard ADCP.

Figure 5: Observations from the northern Scanfish survey. Upper panel: total volume of particles larger than 0.1 mm, as measured by the LOPC. Second panel: dominant particle size-class, defined as the 15-micron bin with the highest total particulate volume. Third panel: chlorophyll concentration. Fourth panel: temperature. Bottom panel: latitude.

Figure 6: Particle size histograms from the northern survey area. X-axis is equivalent spherical diameter; Y-axis is fractional volume per micron. Blue: offshore (south of 18.67° N). Green: offshore (north of 18.67° N).