

## Shallow Surveying in Hazardous Waters

Thomas C. Lippmann

*Center for Coastal and Ocean Mapping, University of New Hampshire, Durham, NH 03824  
Tel. (603) 862-0801, Fax (603) 862-0839, Email lippmann.2@osu.edu*

Gabriel M. Smith

*Byrd Polar Research Center, Ohio State University, Columbus, OH 43210  
Tel. (614) 774-1610, Email smith.3043@osu.edu*

Bathymetry around harbor entrances or inlets is of particular interest to mariners as this is often a region of rapidly shifting sands and submerged shallow water hazards. Obtaining and disseminating dense bathymetric observations of inlets is necessary to ensure safe navigation. It is also a region of high scientific interest as sediment fluxes through inlets are often high, and thus plays an important role in contaminant transport and in determining the rate of POC transmitted to the continental shelf by rivers. Unfortunately, difficulties working within shallow hazardous water often precludes accurate measurement of water depth both within the river channel where high flows rapidly change the location of the channel, ebb tidal shoals, or sand bars, or around rocky shores where submerged outcrops are poorly mapped or uncharted. In this work, we present observations of shallow water bathymetry in and around the Piscataqua River Inlet in Portsmouth, NH. The data were obtained over a two-week period in September 2007 from the Coastal Bathymetry Survey System (CBASS), a personal watercraft equipped with differential GPS, single-beam 192 *KHz* acoustic altimeter, and onboard navigation system. The presentation will discuss both the CBASS capabilities and operational properties as well as the data obtained in Portsmouth.

The CBASS has been used extensively within rugged marine environments such as the surf zone where breaking waves are present, and along fresh water water bodies in the Great Lakes and inland rivers near bridge piles. Estimated accuracies of the survey system is 0.07-0.10 *m* in the vertical, and on the order of 0.1-1 *m* horizontally depending on the water depth and bottom slope. The high maneuverability of the personal watercraft makes very shallow water bathymetric surveys possible with acoustic altimeters, particularly in regions where airborne remote sensing systems fail (owing to water clarity issues) or where repeated high resolution surveys are required (*e.g.*, where an erodable bottom is rapidly evolving).

Three regions were surveyed near the Piscataqua river mouth. The first region covers Pepperell Cove; the second along the rocky outcrop to the north of the inlet near Garrish Island; and the third to the south of the inlet near Ordiones Point. Observed water depths range from 0.5 *m* near the shoreline and over rocky outcrops to over 25 *m* in the river channel. A total of 421 cross-shore transect lines (ranging 1-2 *km* in length) separated at 20 *m* alongshore spacing were surveyed on 10 days and covered a regional area approximately 10 square kilometers. The operation of the survey vessel in waves, amongst rocky hazards, and across the river channel will be discussed.