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# Challenges of Observational Oceanography in the Modern Coastal Ocean

By Charles A. Nittrouer

To validate numerical models, to provide ground truth for remote sensing, or just to understand oceanographic processes, scientists need to make measurements in situ. The ocean has always been a hostile place with strong forces (winds, waves, currents), unwanted biological friends (biofouling), and chemical hardships (corrosion). However, humans are progressively expanding their domain, and consequently, the coastal ocean is becoming an even tougher place to work.

To obtain time-series records of sediment dynamics, we deploy instruments in the water column (moorings) and on the seabed (tripods). However, intense bottom fishing using nets, such as those encountered during work on sedimentary processes in the Mekong Delta region, can unintentionally snag the instruments. Anchoring at a deployment site consumes ship time but can help protect the expensive instrumentation. Although such time

series cannot be long in duration, they can provide valuable insights into diurnal variability of processes (e.g., on tidal time scales). During the ebb-tide flow of the Mekong River in the season of peak discharge, the river plume extends onto the continental shelf (Figure 1). Observing the tidal modulation of associated processes is valuable for understanding the dynamics of the system. Unfortunately, floating nets (not tethered to a ship) move with those same tidal currents, and can envelope a ship before the anchor can be pulled and the ship moved (Figure 2), presenting a challenge for the ship and crew, and for making measurements.

To obtain records about spatial variability of water and seabed, ship transects are run with scientific gear mounted on their sides. We now know of the large floating plastic accumulations in open-ocean gyres, but most of these flotsam and jetsam have passed through the coastal

ocean. Operating vessels with gear in the water is a great way to snag all manner of floating trash. Acoustic Doppler current profilers mounted on the side or seismic transducers towed off the stern can become the brooms of the coastal ocean (Figure 3), jeopardizing measurements and instruments.

Observing the coastal ocean so we can understand and protect it has never been easy, but the new reality is that the challenges are increasing significantly.

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**FIGURE 2.** Fishing nets snagged on an acoustic Doppler current profiler, and attempts to cut and pull the nets off.



**FIGURE 3.** A sheet of plastic trash entangled in a seismic transducer that had been towed from the ship.

**FIGURE 1.** The Mekong River freshwater plume in the East Sea, moving from right to left during ebb tide.