

Beyond the Horizon Vessel Detection and Current Mapping

Background: The National High Frequency (HF) Radar Network (<http://hfradar.ndbc.noaa.gov/>) provides beyond the horizon surface current measurements along the coastal regions of the United States. There are 125 radars currently in the network with a plan to build the network out to 300 (<http://www.ioos.gov/hfradar/>). This network is one component of the U.S. Integrated Ocean Observing System (IOOS) led by NOAA.

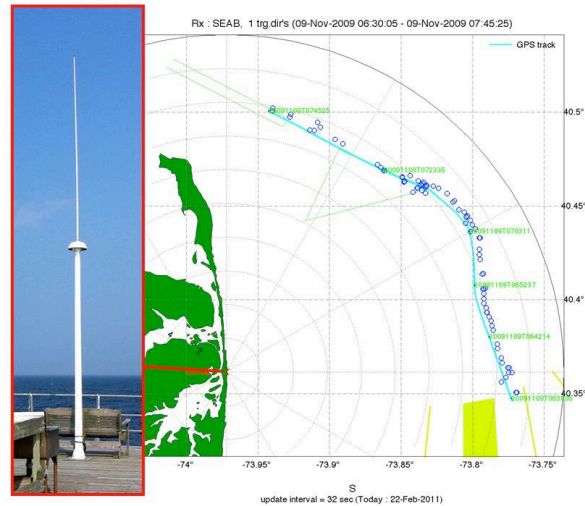


Figure 1: Left: Picture of HF radar antenna and Right: Radar detections of the YM Los Angeles (circles) overlaid on the GPS (aqua line) as it enters NY Harbor

The CODAR HF Radars in the IOOS Mid Atlantic Region have provided surface current measurements to the US Coast Guard for Search And Rescue since May 2009. They have an

operational goal of 80% data coverage 80% of the time. The radars are also capable of detecting the speed and location of vessels at sea.

This dual use capability was demonstrated by CODAR Ocean Sensors and Rutgers University in 2004. The conclusion of the research was that vessels could be detected without degrading the measurement of surface currents. The removal of false alarms and association with real targets was accomplished with a person in the loop. Existing trackers adapted from underwater acoustic vessel tracking worked well with the associated HF Radar detections and their uncertainties as inputs.

Capability Gap: Dual use HF radars will address gaps in persistent surveillance of U.S. Coastal waters and harbor approaches at beyond line-of-sight ranges. HF radar will detect both cooperative and uncooperative vessels and will be sensitive to vessels below the mandatory threshold for AIS use. HF radar will provide the longer range situational awareness necessary to successfully detect and track smaller vessels in the large vessel clutter.

Current Capability & Way Ahead: The first real time dual use HF radar is currently monitoring the approaches to New York Harbor. This radar is operating in both monostatic and bistatic mode within a DHS/DoD sponsored testbed. The technology was also recently demonstrated at a DHS exercise at the Port of Miami in April 2011. Installing the real-time detection software on multiple systems in the Mid Atlantic test bed will allow engineers and operators to develop and exercise the association algorithms needed to improve detections and reduce false alarms. This will also provide the opportunity to test the detection and tracking algorithms using the Open Mongoose fusion engine to verify the value added capability of this data stream. Once proven, the software can be installed at other locations around the nation through a subscription service, executing special tests and exercises against different threat scenarios and locations.