Seafloor Mapping with the IRIS ASV

The Woods Hole Science Center incorporated an Autonomous Surface Vessel (ASV) into seafloor mapping operations in June, 2006. The ASV is designed to operate in shallow-water (1 - 5 m) and will be used to map surficial sediment distribution and thickness, and seafloor morphology (depth). The WHSC has 'named' the vehicle IRIS (Independently (or) Remotely Influenced Surveyor).

IRIS is a catamaran-based platform, 10 feet in length, 4 feet in width, and approximately 260 lbs in weight. IRIS is currently configured with a chirp dual-frequency sidescan-sonar (100/500 kHz) and seismic-reflection profiler (4 - 24 kHz), single-beam echosounder (235 kHz), and a wireless video camera. The IP-based video camera has audio in and speaker out functionality and is used for obstacle avoidance and communication with curious boaters. The vehicle is operated remotely through a wireless modem network enabling real-time monitoring of data acquisition. IRIS is navigated using RTK, and heave, pitch and roll are recorded with onboard motion sensors. Additional sensors, such as ADCPs, can also be housed within the vehicle. IRIS is able to operate in previously inaccessible areas and will augment existing USGS shallow-water mapping capabilities.

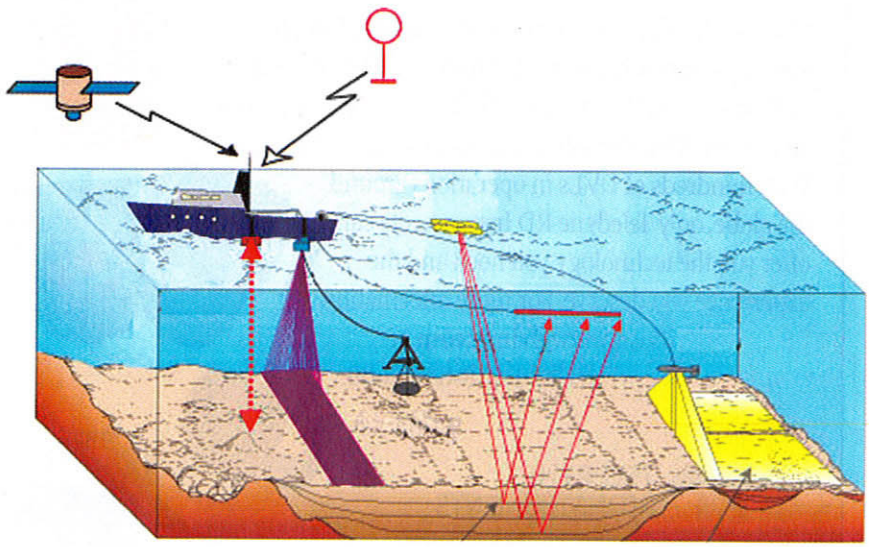
End-view of IRIS underway in Apalachicola Bay, FL, June 2006. Field operations were based aboard the R/V Rafael. (Photo Credit: http://woodshole.er.usgs.gov)

System Operation

When in survey mode, IRIS is monitored by a 'chase-boat'. Operators aboard the 'chase-boat' control vehicle deployment and recovery and continually assess data quality and system operation. IRIS has an operating range of approximately 800-m, limited by communication with the 'chase-boat'. Minimum operating depth is limited by the depth of the keel (18 inches).

Communication from the 'chase-boat' to IRIS is via an Ethernet switch, wireless modem network and multiple laptop computers. An OIS (Operator Interface Software) package communicates directly with IRIS and enables the operators to power-up and open communication links with the various subsystems (e.g. sidescan-sonar). This allows real-time monitoring (quality control) of transmitted and received messages.

Survey tracklines are defined within GIS or navigation software and converted to a mission file with the OIS package. After review, the mission file is transmitted to IRIS for storage and execution. When all subsystems have been powered-up and communication links established, the navigation software is launched for real-time viewing and logging of data. The sidescan-sonar, seismic-reflection and echosounder data are monitored separately and logged locally on the



(Photo Credit: http://woodshole.er.usgs.gov)

RIS aboard the boat operated by Apalachicola National Estuarine Research Reserve for deployment at the survey site. (Photo Credit: http://woodshole.er.usgs.gov)

subsystems. At the end of survey operations data are either downloaded locally are across the network to a laptop computer. RIS is powered by 2 to 4 24 volt NiMH batteries and has an approximate run-time of five hours (based on battery reserves). The batteries cannot be entirely exhausted during run-time, as they provide the power source for downloading data at the end of survey operations.

System Usage

IRIS was first used in June 2006 within Apalachicola Bay, FL, a shallow-water estuary located along the northern Gulf of Mexico. This mapping effort is part of a multi-year collaborative study between the USGS and NOAA Coastal Services Center and is designed to map the distribution of oyster habits within the bay. IRIS successfully operated in water depths ranging from 1 to 4 m and will continue to be utilized within shallow-water areas to augment existing USGS seafloor mapping capabilities.

(Photo Credit: http://woodshole.er.usgs.gov)

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