UTIG Sub-bottom Profiling Systems 2014-11-11

UTIG owns and maintains an integrated sonar system for use in conducting **C**ompressed **H**igh **I**ntensity **R**adar **P**ulse (CHIRP) subbottom profiling of the upper sediment layers of the ocean bottom or various fresh water systems. The 3200-XS system was purchased in 2007 from Edgetech Corp. of West Wareham, MA (see www.edgetech.com) and can be deployed in water depths from ~2 m to >300 m with an optimum towing height of 3-5 m above seafloor. Deployment and recovery of the towfish can be done by shipboard winches for shallower deployments or a larger UTIG-owned Electro-Hydraulic winch. Constraints on vessel size are dependent on shipboard winches capability of handling either the large (190kg SB-512i) or small (76 kg SB-216S) towfish. Power control, navigation, video display, data acquisition and data storage are all performed by one topside processing unit. The system can be powered by 18-36 VDC or 110/240 VAC (auto-ranging). Contact John Goff for more information.

The system is presently comprised of:

- 3200-XS topside computer processor
- 4-transducer SB-512i towfish
- 1-transducer SB-216s towfish
- electro-hydraulic winch with 500 m of armored tow cable
- 3 shallow water tow cables of 10, 25, and 50 m length
- GPS navigation system (see below for details)

Topside Computer Processor:

The 3200XS topside unit (Fig. 1) consists of a ruggedized, 19" rack mount processing computer with peripheral flat panel screen, keyboard and trackball. Navigation input is via NMEA 0183 data stream through a serial port that is written into the headers and is DGPS-compatible. Data are stored in either native Edgetech (.jsf) format or industry standard SEG-Y format and can be downloaded via DVD-RW, USB port, or LAN connection. Power amplifier is 2KW. The DISCOVER software provided by Edgetech can be used for bottom sediment classification, bottom tracking, and heave compensation. Ping rates of up to 18 Hz are possible. Seismic processing and data quality control have been performed in the field using UTIG-licensed software (Focus, Paradigm Geophysical) on laptop computers. Availability of this service is determined by software licensing and personnel issues.

SB-216S Towfish:

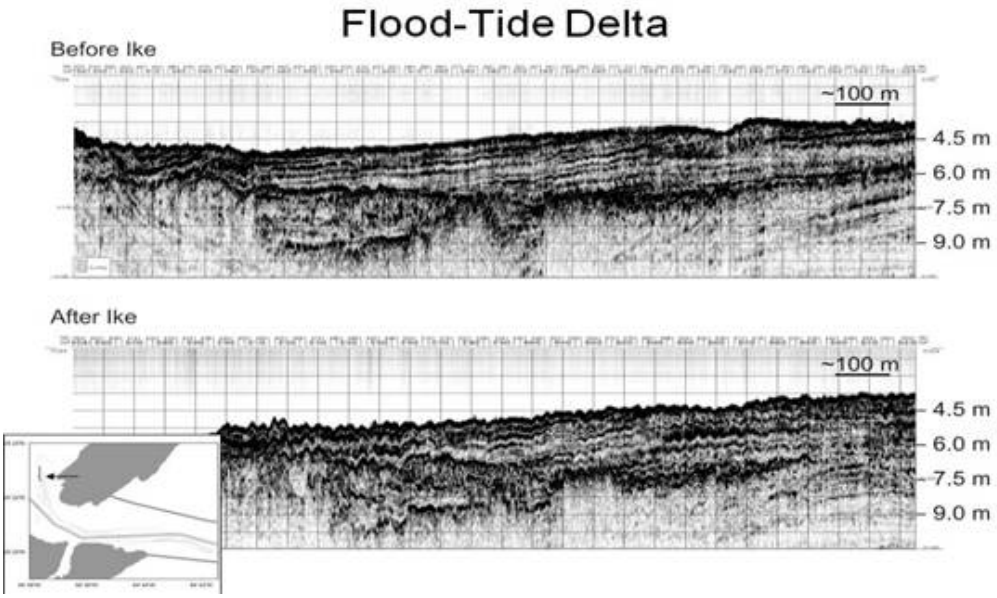
The user also has the option of using the lighter (76 kg) and smaller (105 cm [L] x 67 [W] x 40 [H]) towfish for shallower water and/or smaller boat operations. The smaller unit has been deployed on UTIG's 22' trailered boat (*R/V Lake Itasca*). The 216i is a single transducer towfish with a pulse frequency range of 2-16 kHz. User-selected frequencies are 2-16 kHz, 2-12 kHz, and 2-10 kHz. Typical vertical resolution limits depend on pulse range selected, but average 6-10 cm. Penetration ranges from ~6 m in coarse sands and gravels to ~80 m in acoustically transparent muds. Beam width is 17°–24°. Optimal tow speed is 3-5 kts. Maximum operating depth is 300 m. When not utilizing the electro-hydraulic winch, the fish is towed with deck cables (10, 25 and 50 m long) of 3 shielded twisted pairs (5 used). These cables only transmit and receive the pulse and their use requires an additional winch cable to take the drag weight of the fish.

SB-512i Towfish:

The 512i is a quad-transducer, 190 kg (160cm [L] x 124 [W] x 47 [H]) towfish with a frequency range of 500 Hz to 12 kHz. Pulse frequency range is user-selected among 2-12 kHz, 2-8 kHz, 1.5-7.5 kHz, 1-6 kHz, 1-5 kHz, and 0.5-5 kHz. Typical vertical resolution limits depend on pulse range selected, but average 8-20 cm. Penetration ranges from ~20 m in coarse sands and gravels to ~200 m in acoustically transparent muds. Beam width is 16°–32°. Optimal tow speed is 3-5 kts. Maximum operating depth is 300 m. When not utilizing the electro-hydraulic winch, the fish is towed with deck cables (10, 25 and 50 m long) of 3 shielded twisted pairs (5 used). These cables only transmit and receive the pulse and their use requires an additional winch cable to take the drag weight of the fish (Fig. 3).

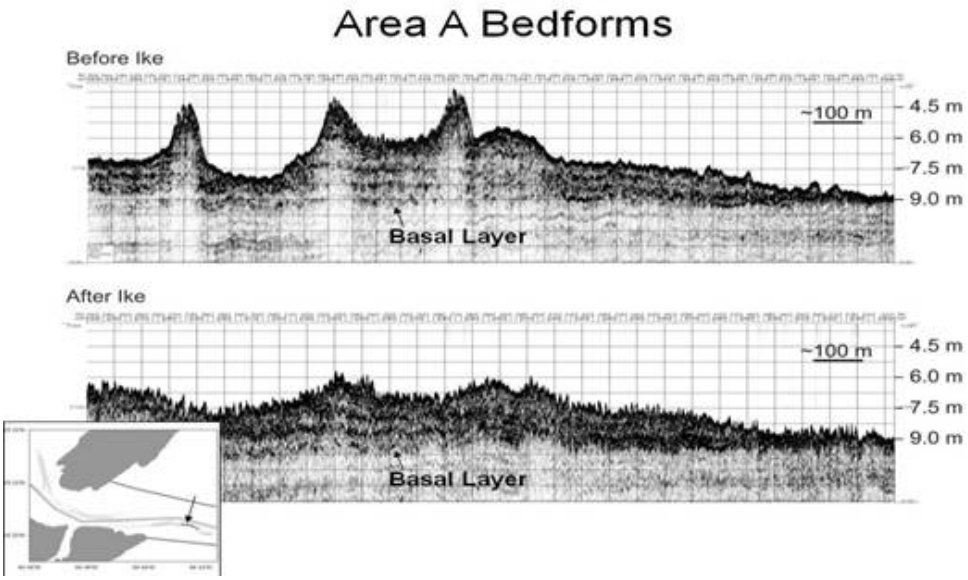
Marine Electro-Hydraulic Winch:
The DT Marine® electro-hydraulic winch is necessary to deploy the towfish in working water depths greater than ~50 m and gives the user the option of deploying on vessels without sufficient winch capability, as long as an adequate A-frame and block are available. The winch is a 210 HP, remote control unit with IEC 8-way stainless steel slip ring with mating connector to deck cable. The unit, excluding shipping crate, is approximately 42"x46"x44" in size and has a shipping weight of 2500 lbs. The 500 m long double armored tow cable (does not require additional tow wire) is equipped with subsea and surface terminations to attach to the topside processor or either towfish.

Data Examples:



CHIRP surveys done in Bolivar Roads Inlet (between Galveston Island and Bolivar Peninsula) on the Texas coast immediately before (May 2008) and after (September 2008) Hurricane Ike. These samples were collected in the flood tide delta of the inlet. The pre-Ike data were collected with the SB-512i towfish (0.5- 5 kHz) and the post-Ike with the SB-216S towfish (2-16

kHz).



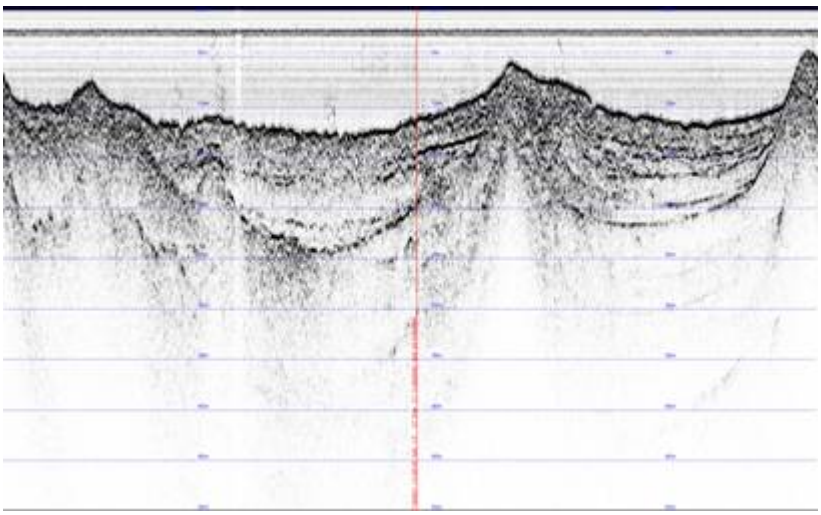
CHIRP surveys done in Bolivar Roads Inlet (between Galveston Island and Bolivar Peninsula) on the Texas coast immediately before (May 2008) and after (September 2008) Hurricane Ike. These samples were collected on gravel-sand ridges oriented normal to the inlet flow that were reworked and degraded by Hurricane Ike. The pre-Ike data were collected with the SB-512i towfish (0.5- 5 kHz) and the post-Ike with the SB-216S (2-16 kHz) towfish.

Portable 3.5kHz System:

UTIG now houses a highly portable chirp (3.5 kHz center-frequency) profiling system capable of being deployed on the smallest of vessels, including skiffs, dories, or other similar craft (Fig. 1). The system consists of a portable version of the the Knudsen® 320 series echosounder and a single MASSA 3.5 kHz transducer, all of which is powered by a single 12 volt battery. The system can generate bottom and sub-bottom image from 3 – 200 m water depth in moderate-to-calm seas (i.e., swells no greater than 1 m). Data are displayed real-time using Knudsen Engineering® software. The Knudsen system generates SEG-Y files recognized by most seismic data processing packages. The system also comes with a GPS navigation unit that stamps the position at each shot point in the SEG-Y header.

Contact Matt Hornbach for more information.

Real-time data collected at Curacao, Netherlands Antilles.



A) Map view of the seafloor for Caracas Bay in Curacao imaged by interpolating several closely spaced chirp lines. White line is the chirp profile shown in panels B and C. B) Uninterpreted chirp profile from Caracas Bay (see A for location). C) Interpreted version of same profile (see panel A for location).