Application Note 1

GeoAcoustics team up with the University of Plymouth for State of the Art Swath Bathymetry Surveying

Background

In the spring of 2002 GeoAcoustics travelled down to the University of Plymouth in the West of England to take part in the MSc & BSc Hydrographic Field Week. Students had been given the task of conducting a Shallow Water Bathymetry Survey in and around the area know as 'Barn Pool' at the intersection of the river 'Tamar' and 'Plymouth Sound'.

Their objective was to obtain highly accurate bathymetry data over a varied topographic seabed ranging from 1m to 45m; using the latest commercially available technology; whilst maintaining available funds. To be able to achieve their objective in the short time that had been allocated for field operations, they elected to use the GeoSwath System.

The Installation

Installation, calibration and system checks were completed on the first day on the university survey vessel 'CatFish' (figure 1).

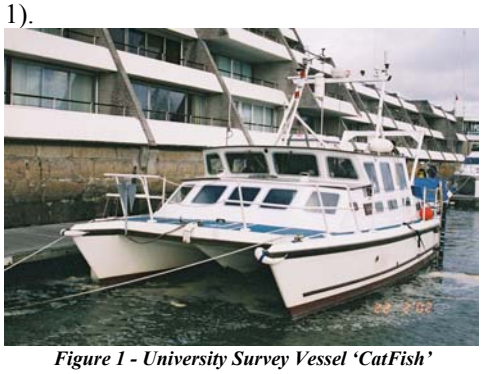


Figure 1 - University Survey Vessel 'CatFish'

The GeoSwath system used in this survey comprised of a deck unit with monitor, keyboard & mouse; one pair of 250KHz transducers and a variety of other peripheral equipment. These were:

- Meridian Gyro Compass to provide heading data
- Differential Global Positioning System (DGPS) for horizontal position
- TSS DMS2-05 Motion Reference Unit (MRU) for measuring heave, pitch & roll
- Tritech Precision Altimeter for Quality Assurance (QA),
- Valeport Mini Sound Velocity Sensor (MiniSVS) for measuring real time sound velocity at the transducer face.

The two GeoSwath transducers, altimeter, MRU and MiniSVS were all mounted on a "V" plate (figure 2) and connected to a series of transducer poles that attached to the survey vessel's existing over the side mount.

Figure 2 – GeoSwath 'V' Plate

By mounting as many of the peripheral sensors as possible directly on to the "V" plate its possible to minimise the number of inaccuracies that may be caused by differential movement between the survey vessel and the transducers. In addition, it also helps to minimise offset errors and MRU lever arm effects on the bathymetry data.

Two other peripheral sensors were also required to obtain accurate bathymetry data:

- Sound Velocity Profiler (SVP) to measure the change in sound velocity through the water column,
- Tide gauge for measuring the changes in water level throughout the survey.

GeoAcoustics provided all of these items (with the exception of the DGPS) as part and parcel of the standard system.

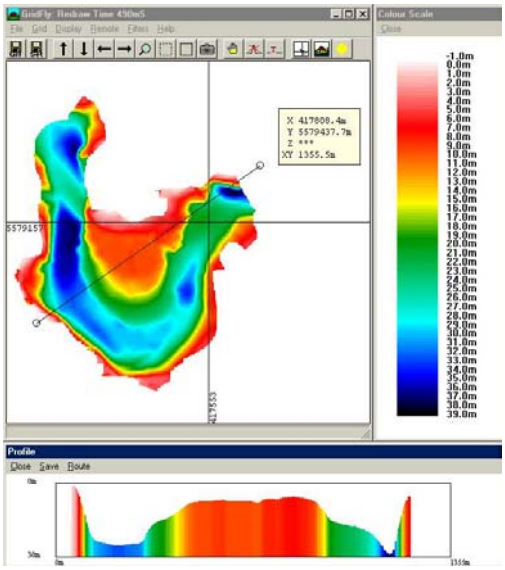


Figure 3 – Gridfly DTM of Barn Pool

The Survey

A plan was constructed, primarily based on a survey speed of 4-5 knots and a maximum swath width of 10 times the minimum water depth.

The survey was then conducted over a three day period, so that all students participating in the field week were exposed to as many parts of the GeoSwath system as possible and to utilise its full range of options and capabilities.

Throughout the survey various sound velocity profiles were taken at different locations and times to accurately record the variations in the sound velocity due to tidal effects. These water column sound velocity profile measurements along with the real time transducer face corrections had significant implications over the accuracy of the bathymetry data obtained in this partially mixed salt wedge estuary. All these corrections were applied within the GeoSwath software at the processing stage.

Survey Processing

Once the survey work had been completed all the students attended a short training course on swath bathymetry processing. This one-day course covered all aspects of data processing including:

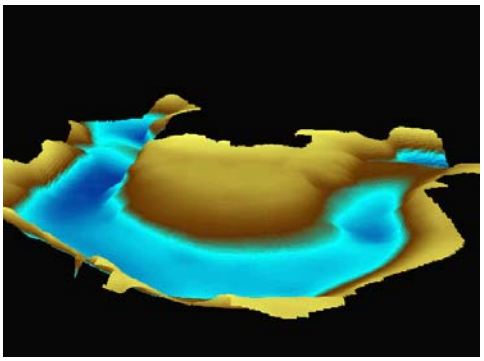


Figure 4 – Gridfly 3D view of Barn Pool

- Correct input of offset parameters between sensors
- Navigation editing of poor DGPS data
- The careful application and correct use of filters for the removal of any erroneous data
- Digital Terrain Model (DTM) generation
- QA of the bathymetry data using the echo sounder files
- Statistical Analysis of the edited data, and then final chart production.

Figure 3 shows a DTM of the survey area taken from the GeoSwath Gridfly program and figure 4 shows the same DTM but in the 3D view.

Students were then provided with a copy of the software so that course and project requirements could be met within the time frame set by their course leader. Of the variety of final products available, figure 5 shows a simple surfer contour plot of the DTM survey area.

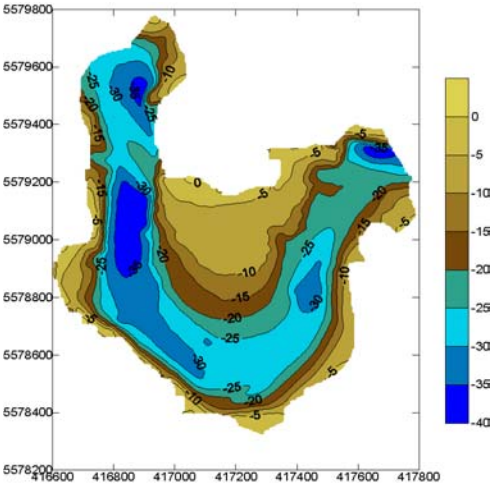


Figure 5 – Surfer Colour Filled Contour Plot

Final Products

The GeoSwath system encompasses every aspect of cost effective swath bathymetry from raw data acquisition to final chart production. Students were therefore able to produce 2D & 3D images, a video fly through of the DTM model, spot depth and contour plots as well as a bathymetry chart of the area surveyed. Figure 6 shows an alternative 3D DTM wire frame view of the survey area.

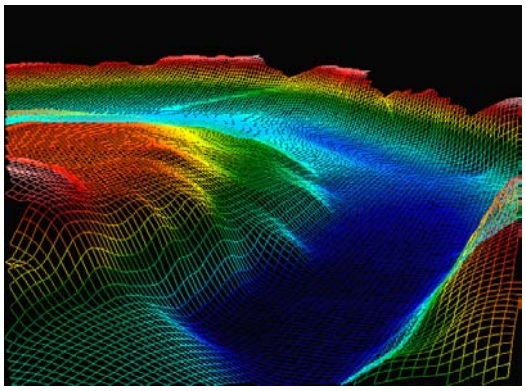


Figure 6 – Wire Frame view of the Barn Pool DTM

The Future

At GeoAcoustics we pride ourselves on the close relationships that we have with the academic world and we acknowledge the necessity to be able to provide valuable field experience to the next generation of Hydrographic Surveyors. It is with pleasure that GeoAcoustics continues to support the University of Plymouth.

Further Planned Activities

Due to recent changes within the academic regime two separate field weeks are planned for the forthcoming academic year. The first of which will be with undergraduate students starting around the 11th November 2002 and the second will cater for the MSc field week that is presently planned for the 10th February 2003.

During these dates it may be possible to demonstrate the system to outside interested parties. For more information please contact the sales team at GeoAcoustics on sales@geoacoustics.co.uk or telephone on +44 (0)1493 600666

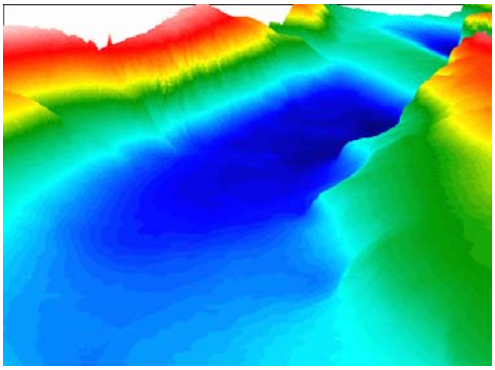
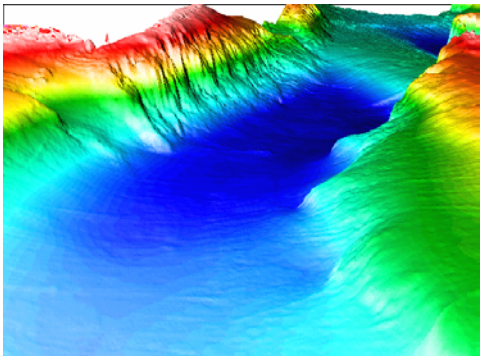


Figure 7 & 8– Images showing the before and after effects of sun illumination



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