



True 3D high resolution sub-bottom profiling: 3D Chirp system design and data examples

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Chirp sub-bottom profilers are widely used to collect very high resolution 2D marine seismic data. The first true 3D Chirp system operating on a bandwidth of 1.5 to 13 kHz has been developed at the Southampton Oceanography Centre. The system incorporates a 2 m x 2.5 m rigid structure which is surface towed. It houses 60 hydrophone groups with 25 cm spacing in both horizontal directions and a four source transducer array which are positioned using Real Time Kinematic GPS and attitude systems with centimetre accuracy. A custom-made data acquisition system has been implemented allowing a shot rate of 4 Hz to achieve sufficient data coverage. Datasets have been collected over targets of geological, marine engineering and archaeological interest. The data has been processed, using standard seismic processing algorithms, to produce fully sampled 3D data volumes which can be readily visualised imaging the three dimensional structures of the top tens of meters of the sub-seabed. The first dataset presented images of sedimentary rocks of the Headon Hill formation on the flank of the Bouldnor syncline in the West Solent (UK). A second dataset images a buried cofferdam in the port of Southampton (UK) whose precise location has implications for port maintenance. The third dataset images the shipwreck Invincible (1758) in the East Solent (UK).