



3D CHIRP - DEVELOPMENT AND TESTING OF A 3D HIGH RESOLUTION SUB-BOTTOM PROFILING SYSTEM

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Chirp sub-bottom profilers are widely used to collect very high resolution 2D marine seismic data. They produce high signal-to-noise ratio data using highly repeatable source signatures. The first true 3D Chirp system was designed and tested, operating on a bandwidth of 1.5 to 13 kHz, using newly designed source signatures. To prevent spatial aliasing of the seismic data and determine optimal source and receiver array geometries, numerical modelling of the source and receiver array directivities was carried out. The resulting design incorporates a 2 m x 2.5 m rigid structure that is towed below the sea-surface from small survey vessels. It houses 60 hydrophone groups with 25 cm spacing in both horizontal directions and four source transducers arranged into a Maltese Cross geometry. Real Time Kinematic GPS and attitude systems are used to position the source and receiver elements with centimetric accuracy. This systems incorporate four antennas fixed to the rigid structure such that they are above the sea-surface during the survey. A seismic data-set over a 36 km² large area was collected on the north coast of the Isle of Wight (UK). The data processing included the geometry assignment and pre-stack Kirchhoff time migration preparing a 3D data volume. Dipping Tertiary Limestone and Mudstone structures are readily interpreted in the first ever true 3D Chirp data volume.