Using seismic reflection data to Map the Gaps

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Using seismic reflection data

Can fill gaps in multibeam data coverage

Seismic data is optimised for sub-seabed targets

However, it is fundamentally the same as multibeam data Uses a sound source and accurate time measurement of sound reflections

Seismic interpreters routinely interpret the seabed horizon

This talk will show use of seismic reflection data to derive seabed depth and show some results



Using seismic reflection data

Multibeam coverage and seismic reflection in Taranaki, New Zealand



Seismic reflection data



Seismic interpreters 'pick' horizons

Picks can be automated for large datasets

Interpretation stored as x, y, TwT

Depth = Velocity_(water) * TwT/2

Issue: Datum for the seismic data - streamer depth, bulk shifts, sample rate



Use independent source of bathymetry data to derive "velocity" (Pseudo-velocity) for the area covered by seismic data

Pseudo-velocity will include correction for streamer depth and bulk shifts

Pseudo-velocity = Depth(independent) / TwT(seis)

LINZ soundings data gridded (we use GMT) to derive a pseudo-velocity map

Depth = pseudo-velocity * TwT



Use independent source of bathymetry data to derive "velocity" for the area covered by seismic data

"Velocity" will include correction for streamer depth and bulk shifts

LINZ soundings data gridded (we use GMT) to derive a velocity map

"Velocity" = Depth(independent) / TwT(seis)

Depth = "Velocity" * TwT



Pseudo-velocity map for 3D seismic reflection dataset

Extract pseudo-velocity from this grid at the location of every TwT pick and determine depth



This dataset has a 12.5 m spacing (can be resampled for Seabed2030 use)

Accurate to c. +/- 2 m (sample rate dependent)

Some artifacts in data (streaks and steps) acquisition/processing

Small features are able to be seen in data

Deepwater seismic reflection dataset



High resolution image of channels, canyons and pockmarks





GNS Science

Near shore seismic reflection dataset





Mound-like feature

600 m across 20 m high

Steps in data due to data sample rate (500 HZ)

Near shore seismic reflection dataset





Sediment waves (?)

1500 m wavelength5 m amplitude

Summary

Seismic reflection data can be converted to bathymetry using widely spaced independent bathymetry dataset to eliminate datum issues

Provides high resolution data suitable for Seabed2030

Useful in areas where there is no multibeam data – mapping the gaps

Future:

- 1. Seabed2030 could request data from petroleum explorers and multiclient seismic companies (only need the seabed pick)
- 2. GNS is working on 2D seismic datasets