SUT
WA Research Night

An introduction to acoustic seafloor observation and geostatistical data interpolation

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- Project Introduction
- Methodology
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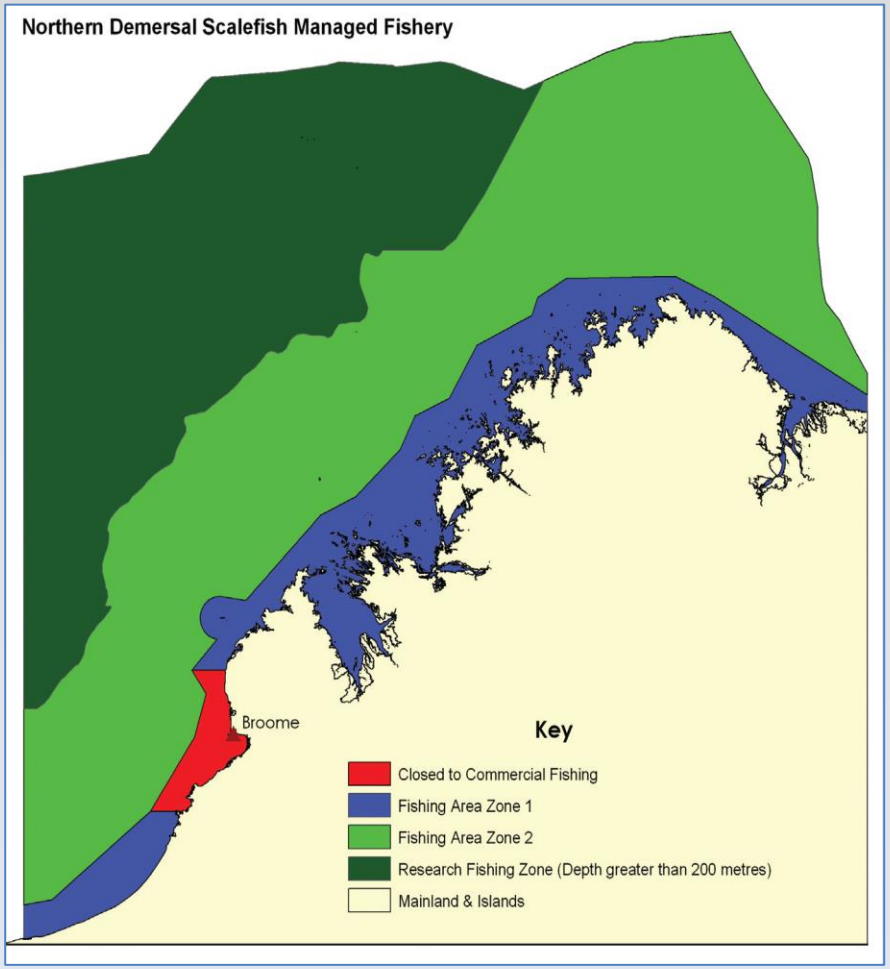
Northern Demersal Scalefish Fishery: Acoustic Project

Provide a cheap, low risk and long term monitoring tool for the Department of Fisheries, by:

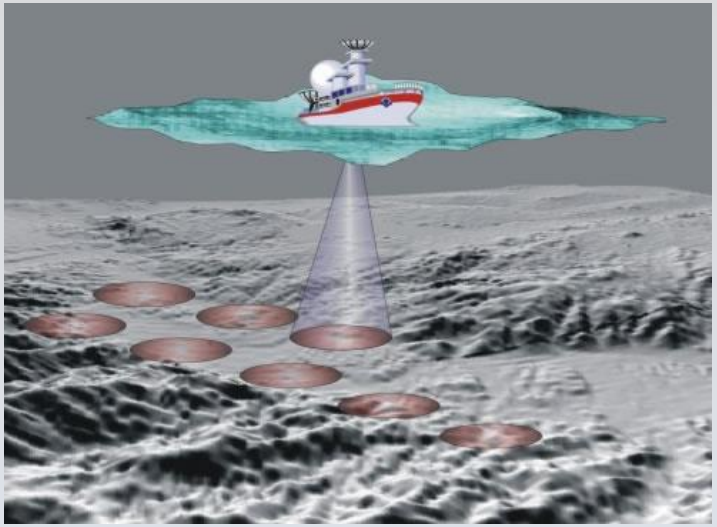
- Mapping seafloor habitats
- Mapping water column biomass
- Determine relative demersal fish biomass
- Identify possible locations of significant fish biomass outside current areas of commercial effort

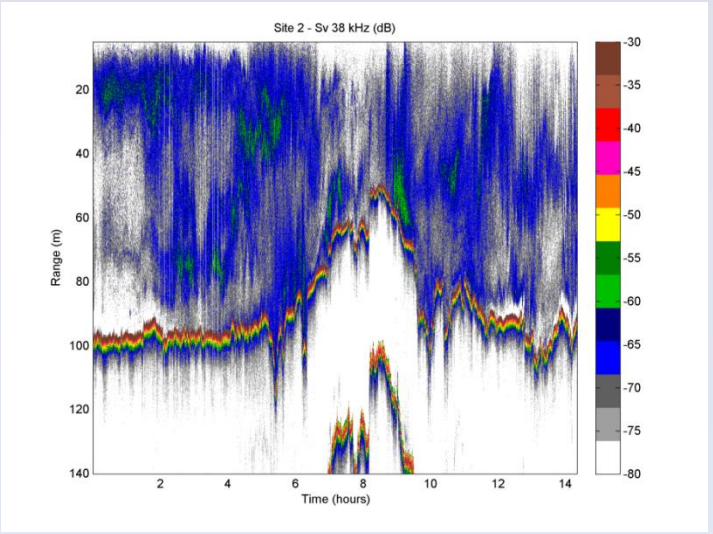


Northern Demersal Scalefish Fishery: Acoustic Project

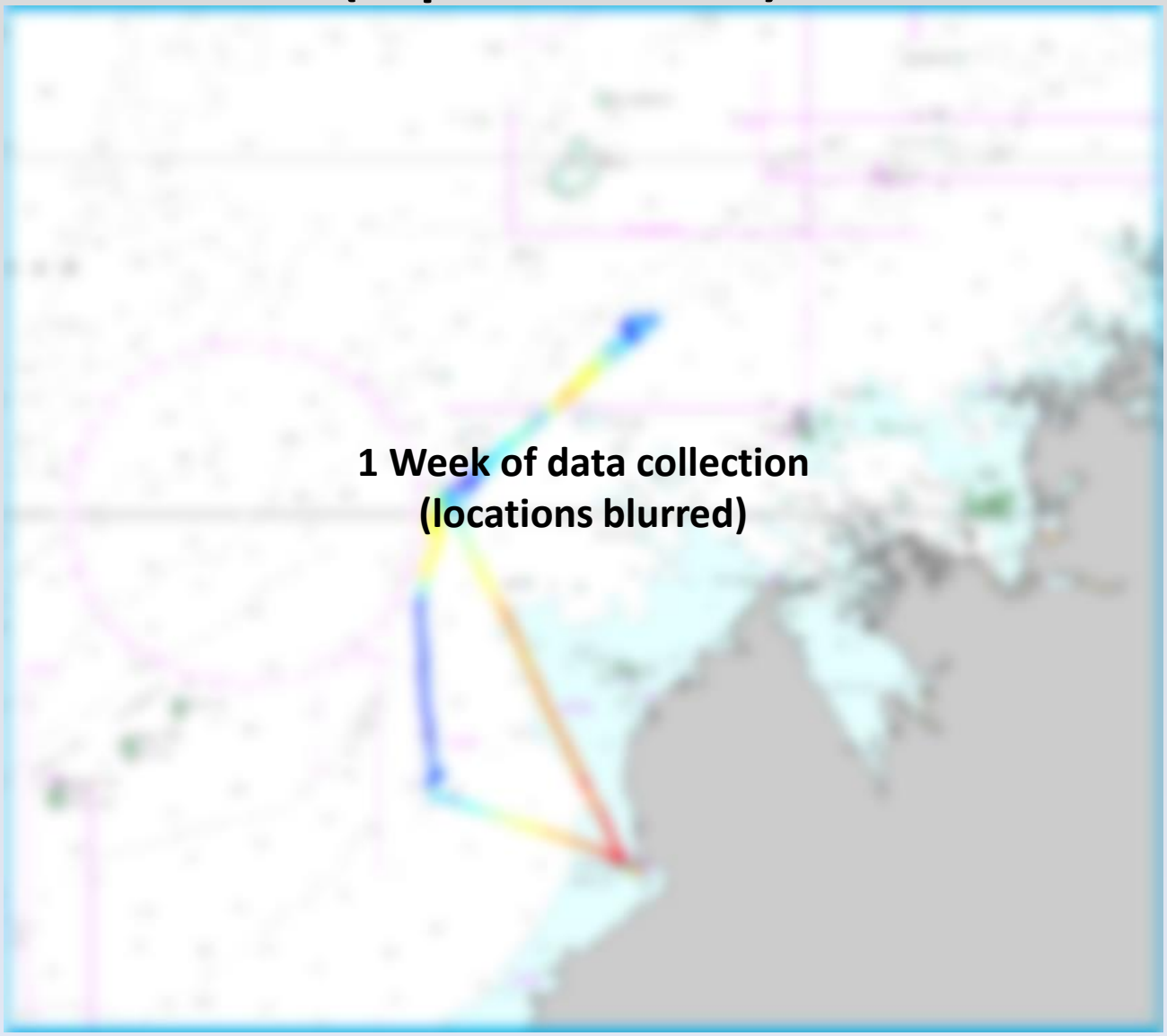
A single beam echo-sounder was attached to a fishing vessel to collect data at four frequencies to help map:

- Bathymetry
- Seafloor substrate (using backscatter)
- Water column biomass

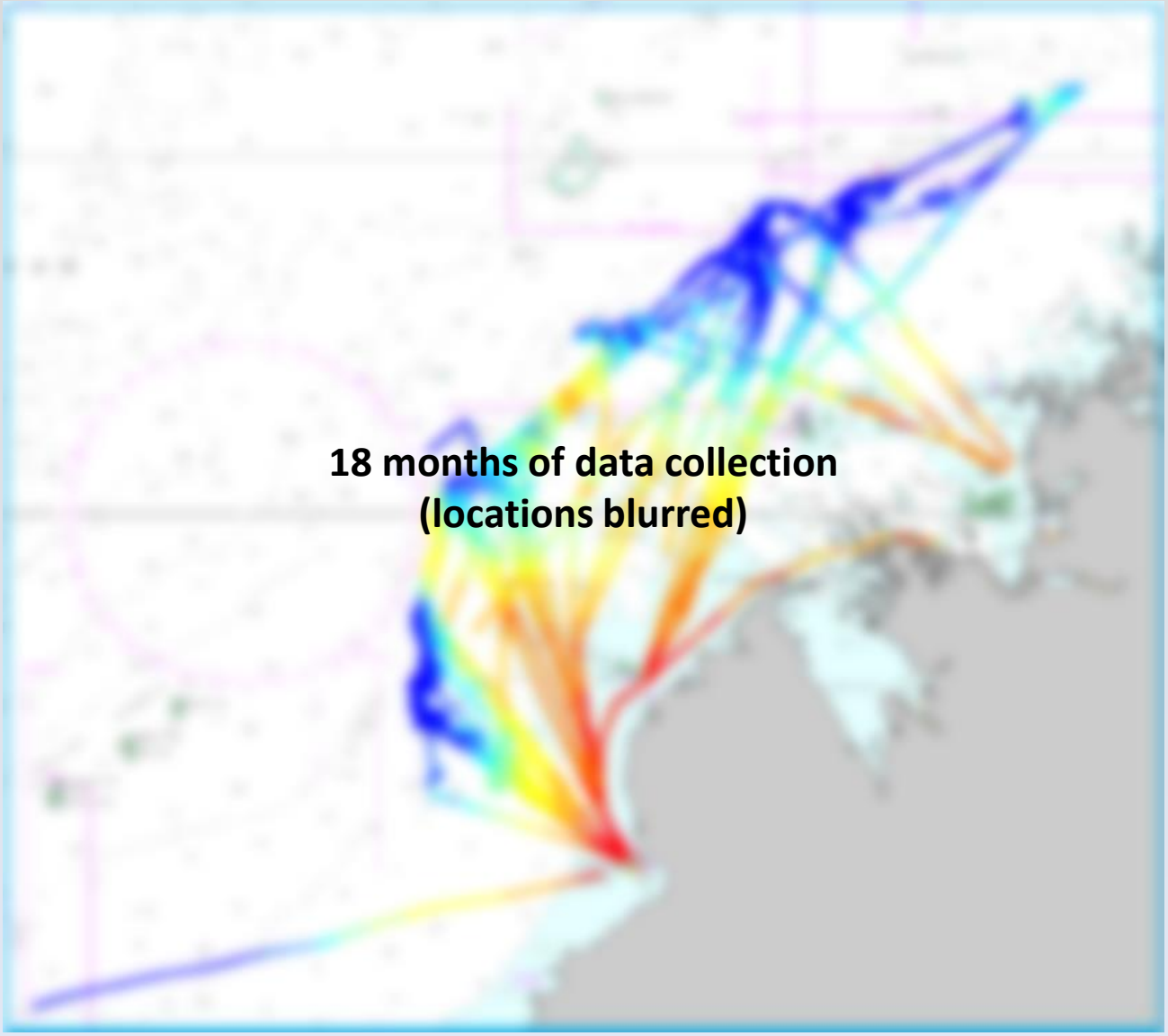




Study Area – Depth from first trip (April 2012)



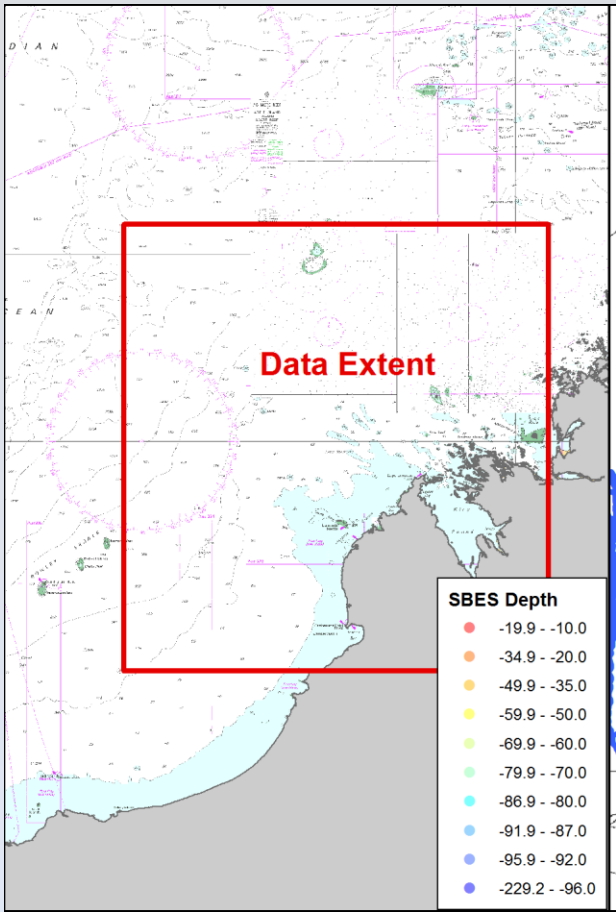
Study Area – Depth from all trips to date and still collecting…

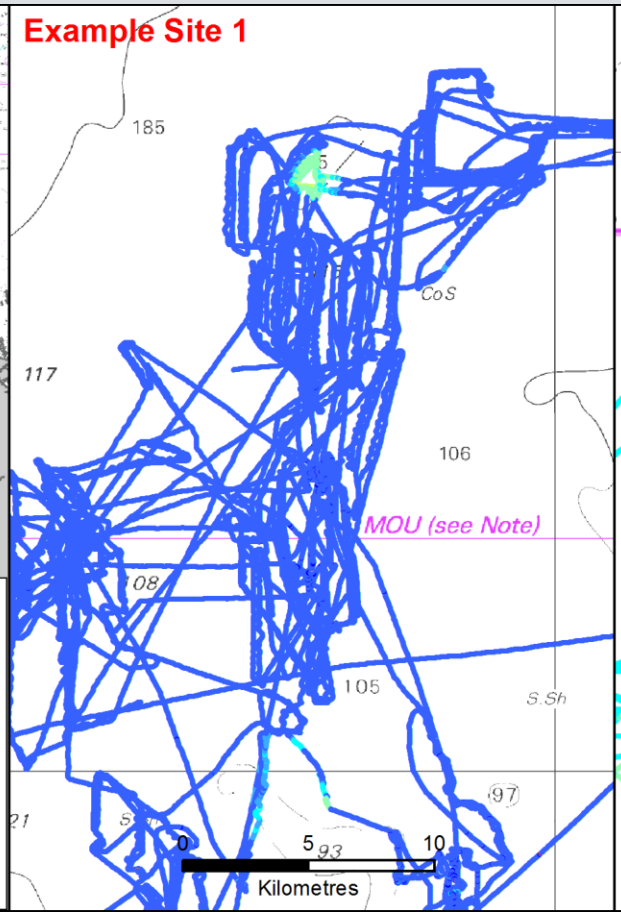


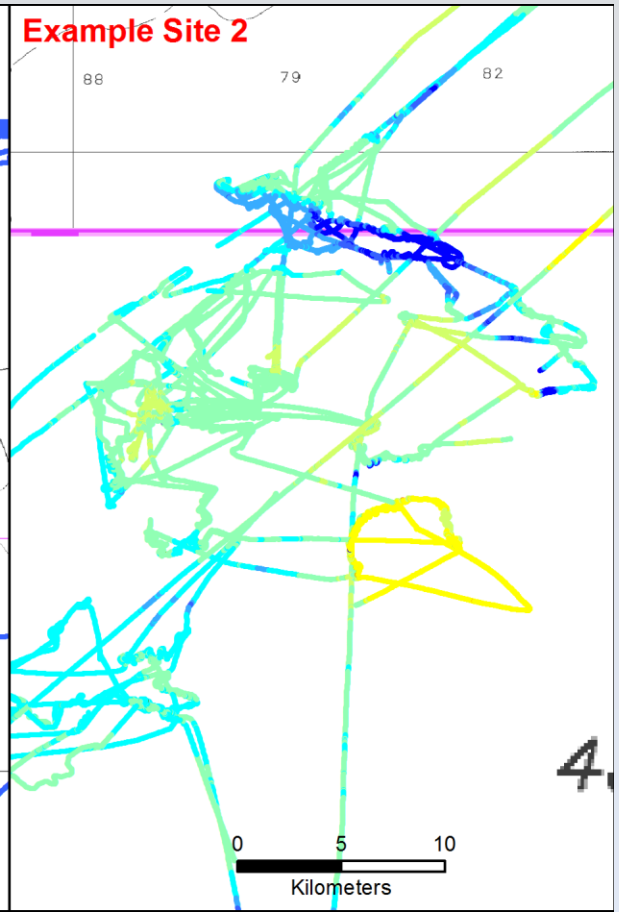
The Problem

Interpolation of single-beam echo sounder bathymetry towards development of a continuous bathymetry grid for the offshore Kimberley region

- Bathymetry estimates from SBES (single-beam echo sounder)
- Interpolation between tracks
- Compilation of multiple data sources for broad-scale grid

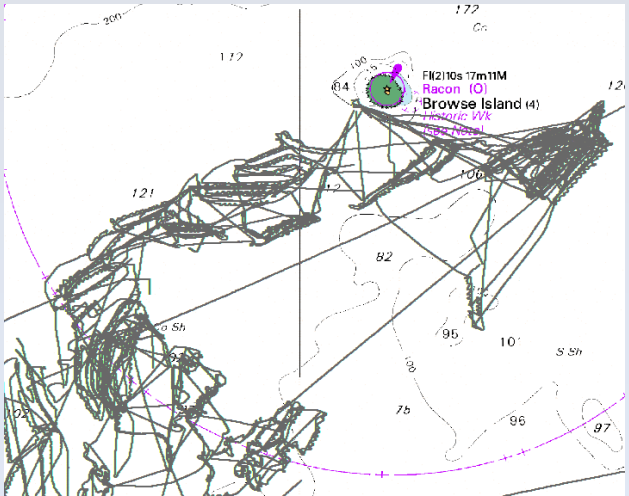


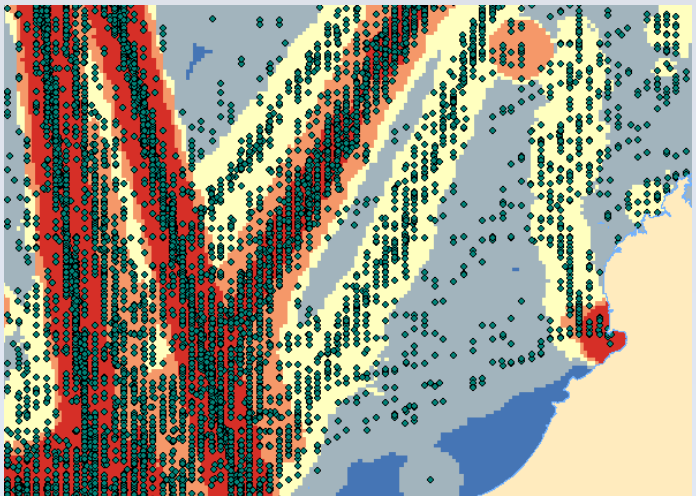




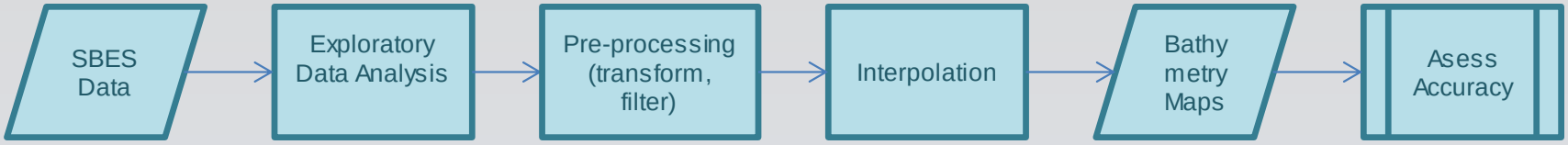
Background: Geostatistics

- Data demands for broad-scale observation and continuous datasets
- Geostatistics vs other estimators (Nearest neighbour, inverse distance weighting, or triangulated irregular networks)
- Surface Interpolation
  - Variogram modelling
  - Kriging





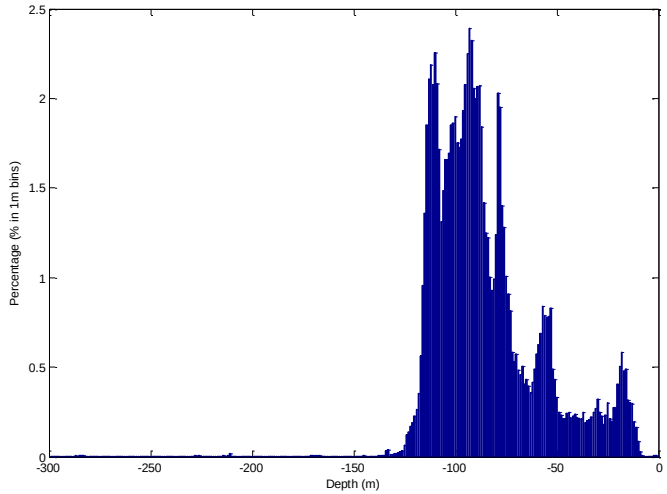
Methodology



- Exploratory data analysis
- Data transformation and filtering
- Variograms and interpolation
- Data comparison and compilation
- Error assessment

Methodology: Pre-Processing

- Exploratory data analysis, spatial statistics
- Trend surface fitting
- Model residuals
- Statistical modelling and normal distributions



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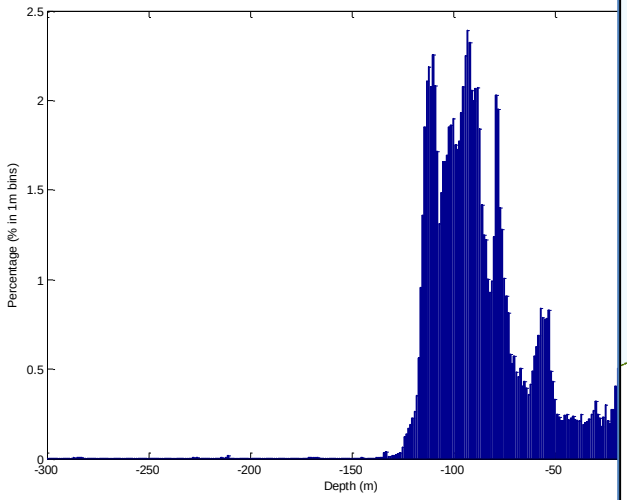

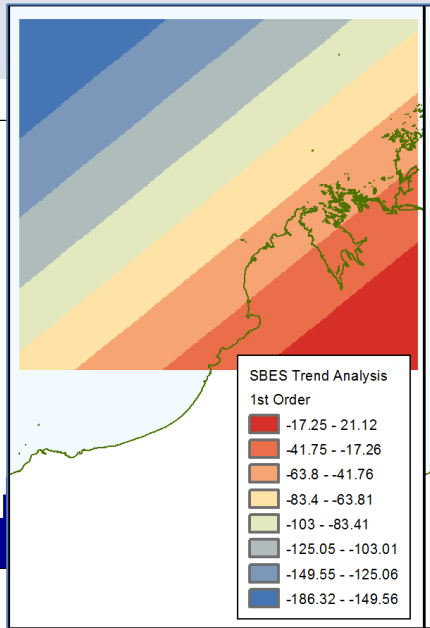

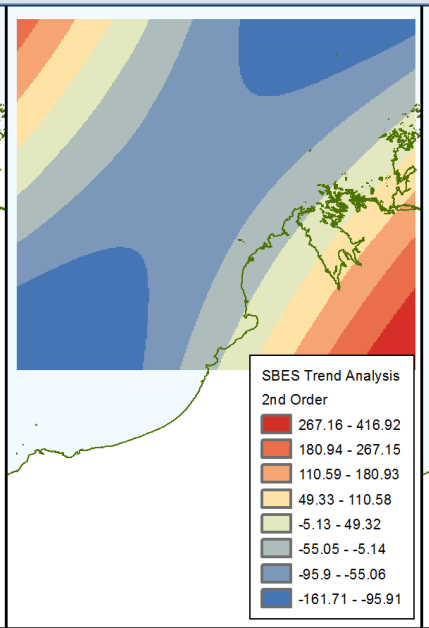

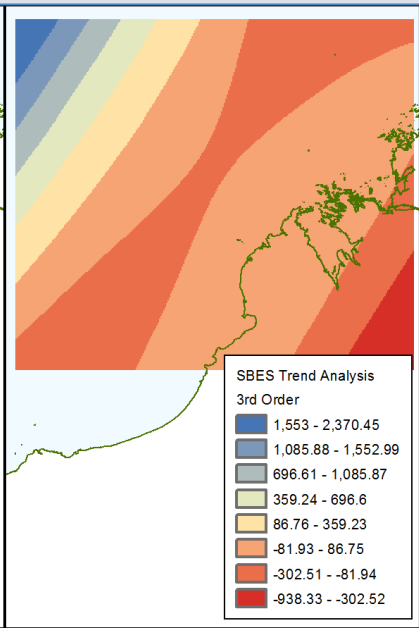

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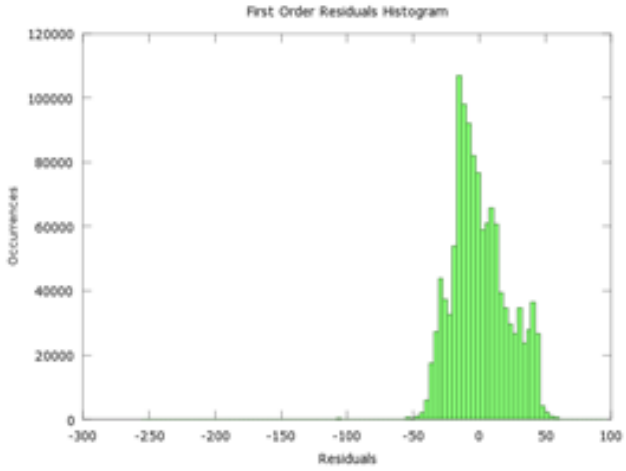
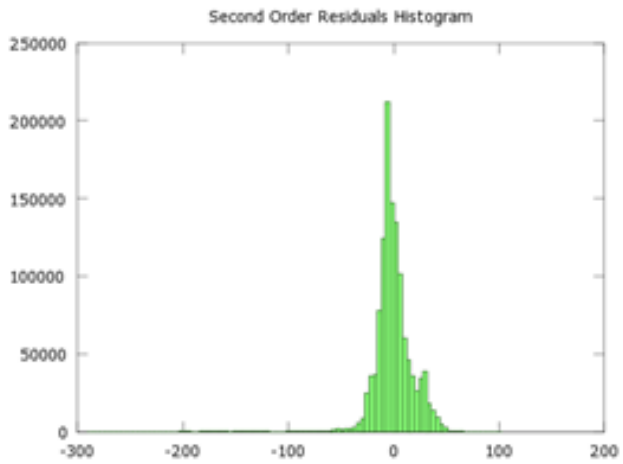
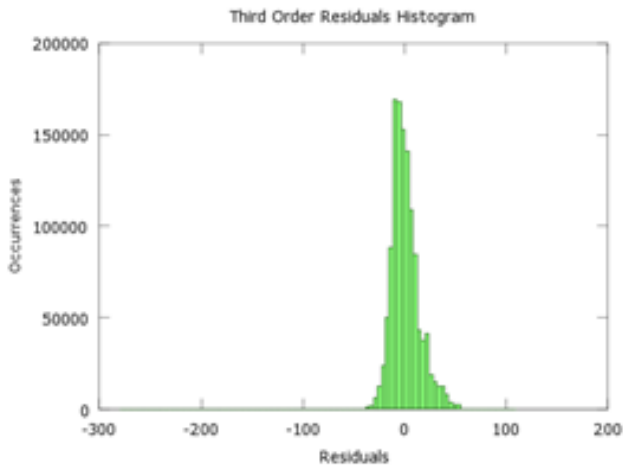
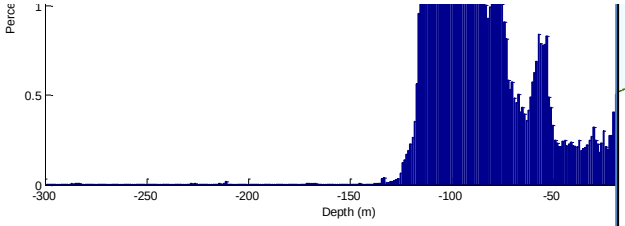
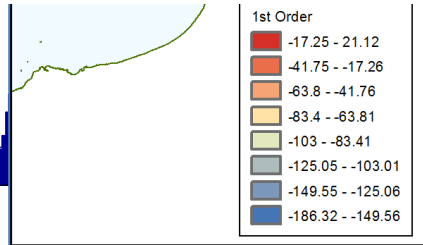
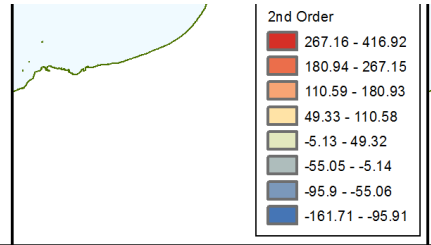


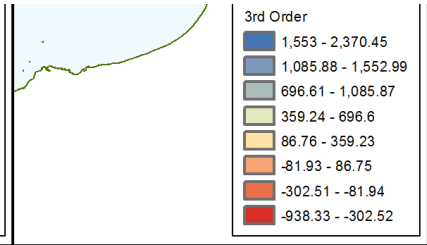






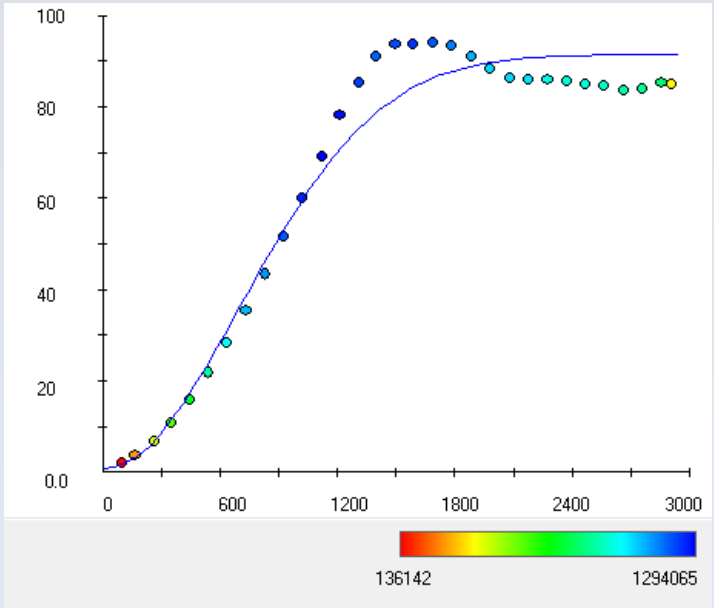


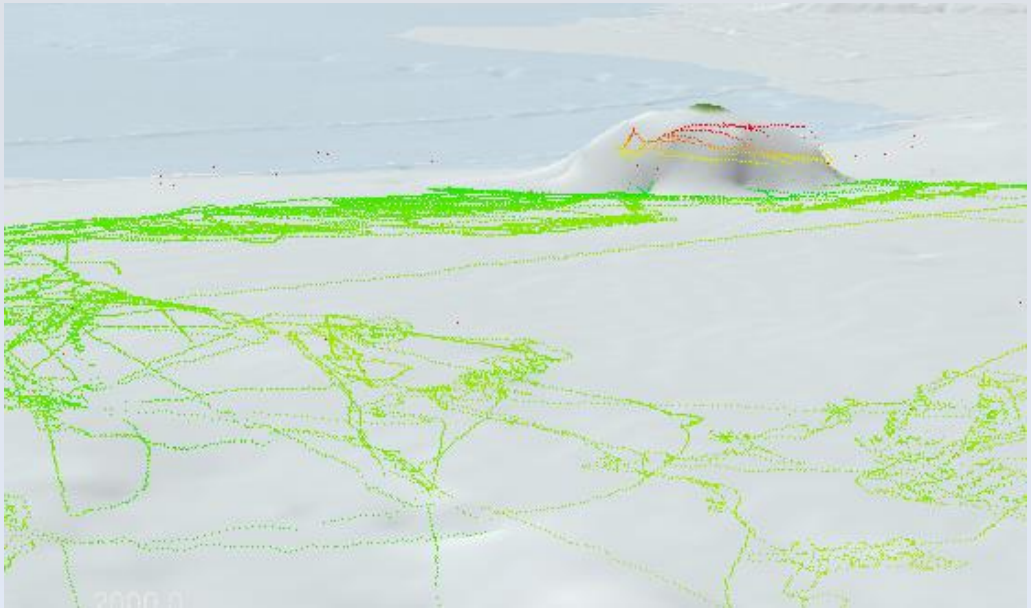




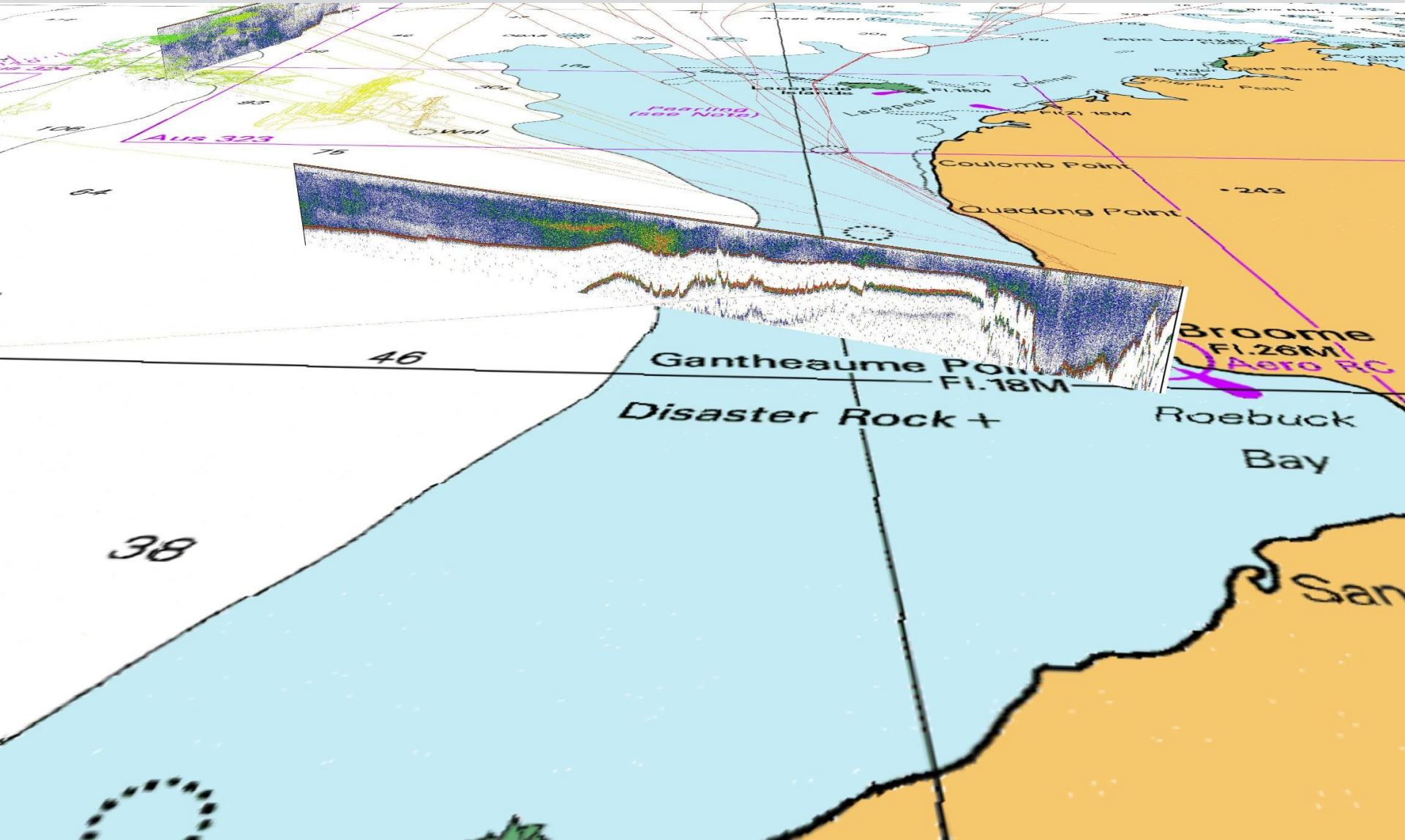
Methodology: Interpolation

- Variogram modelling of residuals
- Kriging interpolation with variogram input
- Cokriging with GA 250m grid





Methodology: Bathymetry Grids



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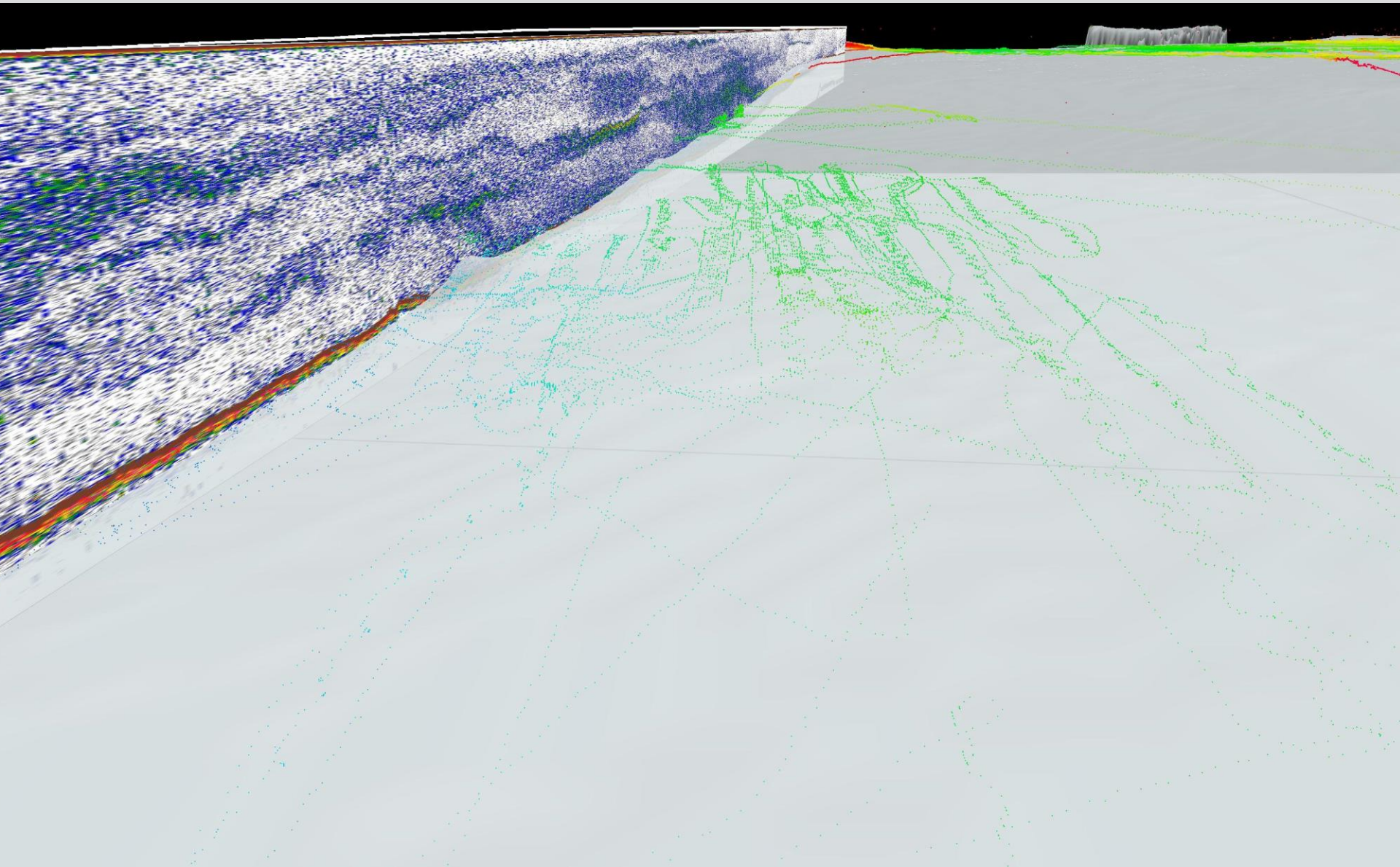
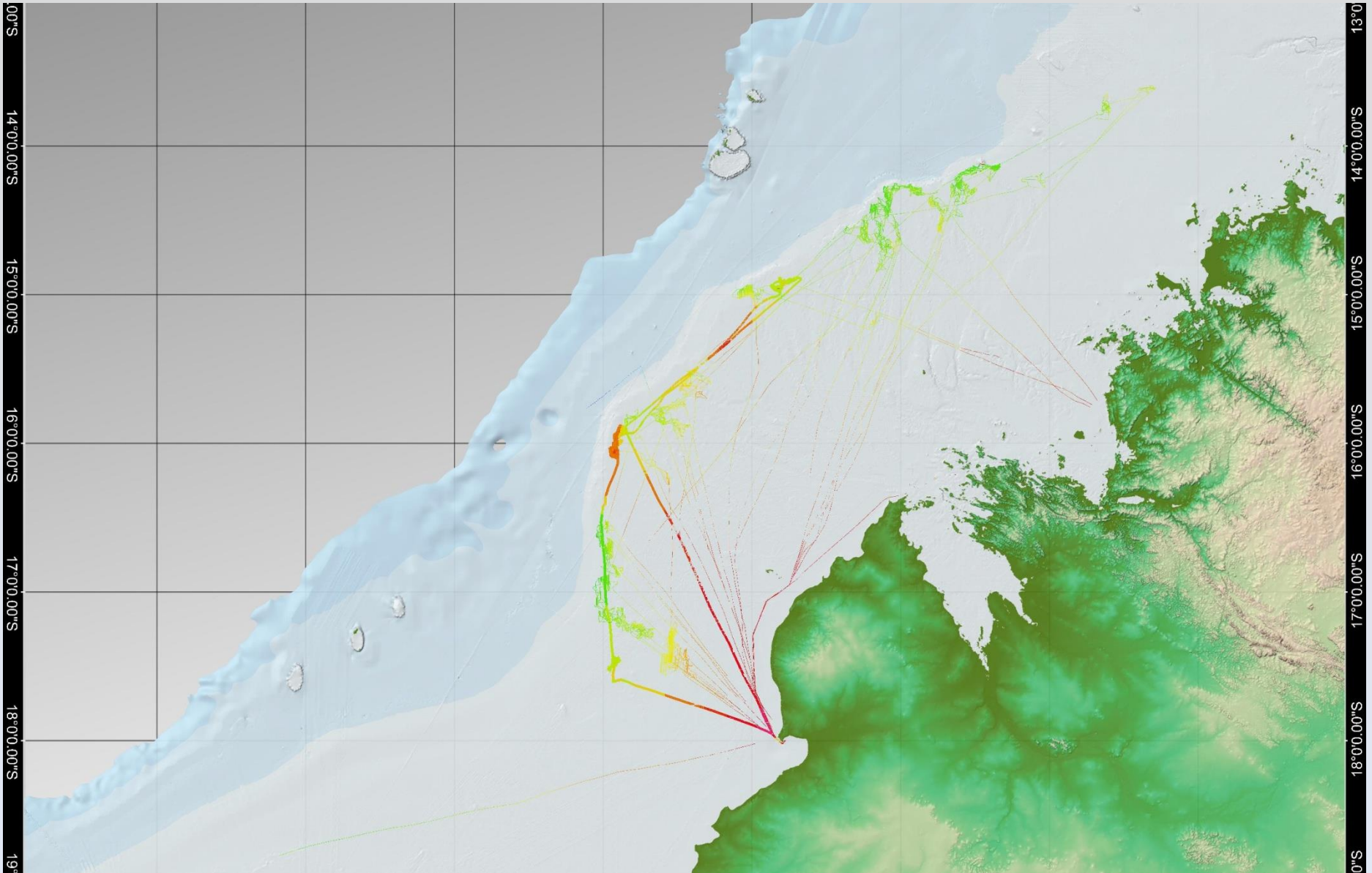


Results



Direction

- Extend interpolation of bathymetry to other properties; sediment composition, substrate depth, and / or water column biomass
- Continuous collection of SBES to contribute to baseline mapping
- Trial of techniques across new geographic extents

Summary

- Use of acoustic observation for broad-scale monitoring of the seabed
- Challenges of interpolating sparse samples to a continuous surface
- Potential to apply techniques to various marine habitat variables

Questions?

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Geosciences Australia

Department of Fisheries & Fishing Vessel MV Carolina M