

Attempting to Improve Acoustic Seabed Classification on the Scotian Shelf: A Multi-Frequency Approach

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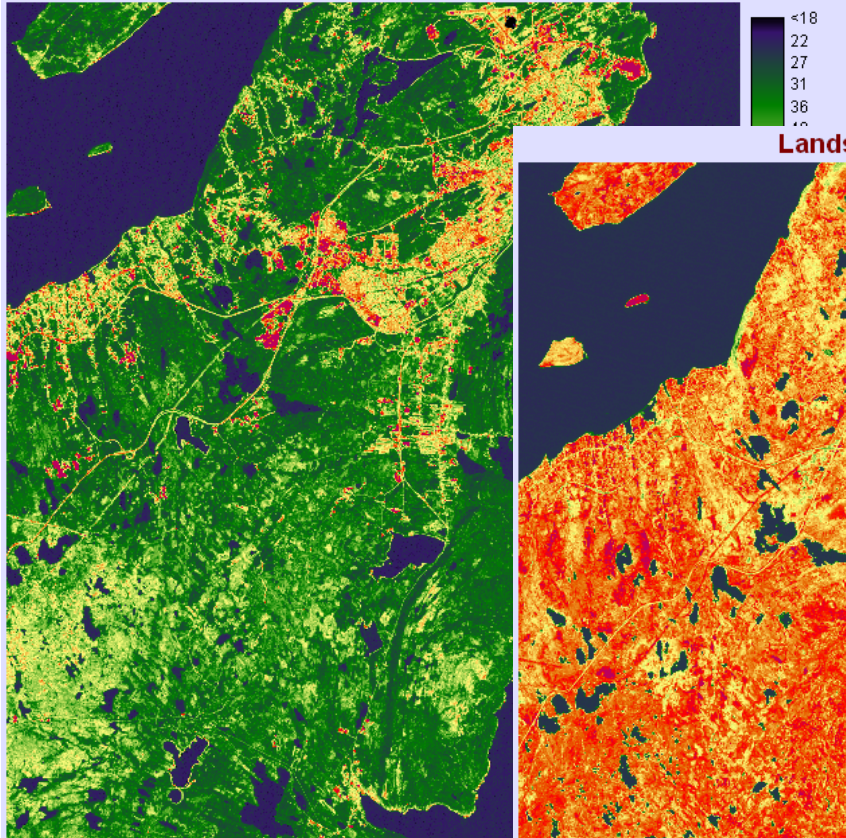
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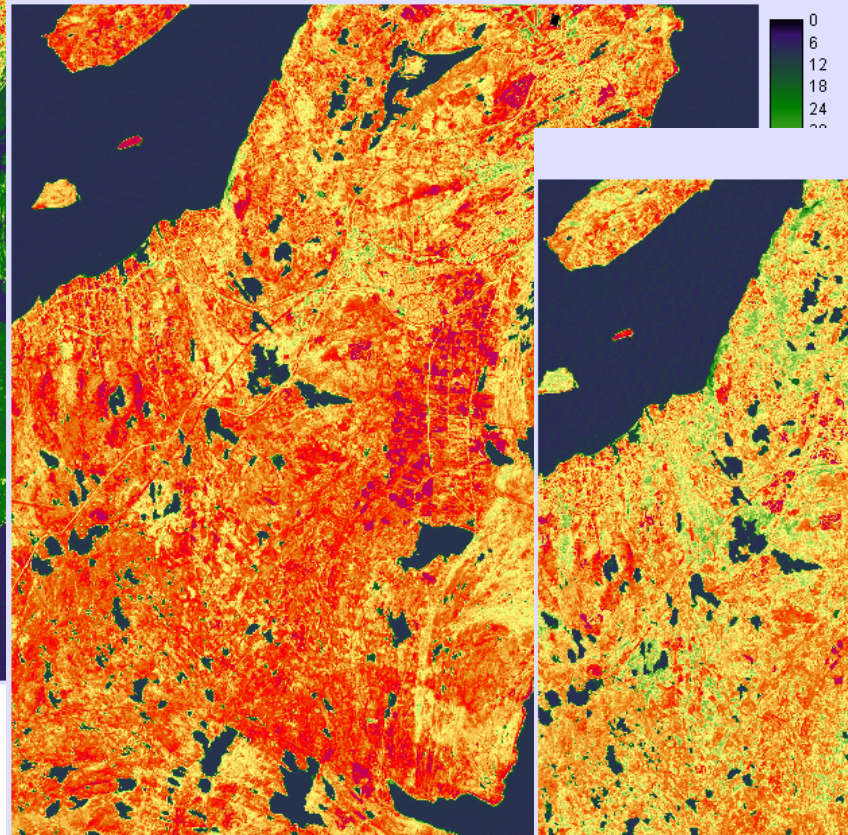


Research Problem

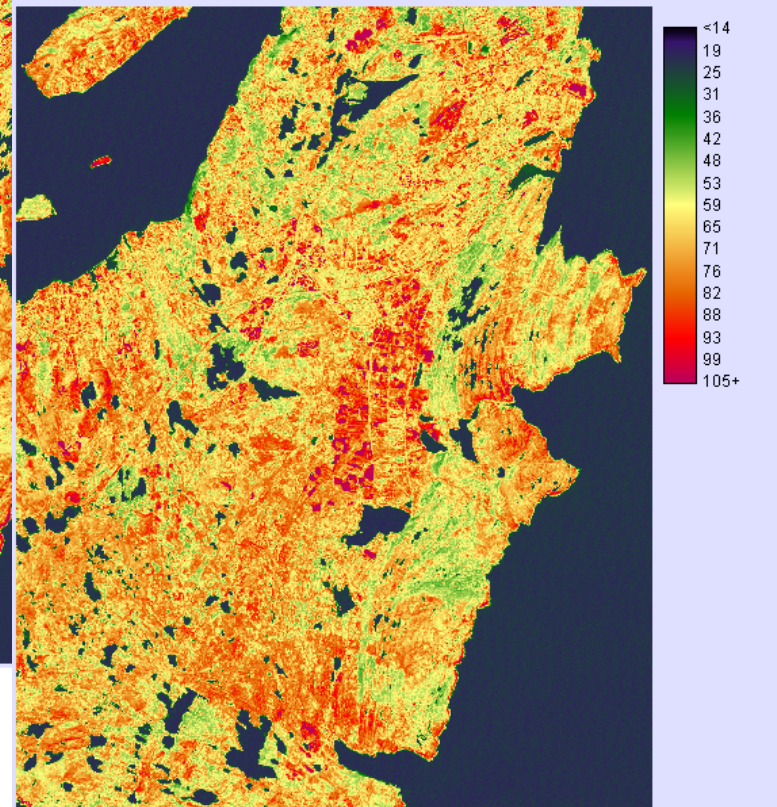
Landsat 7 Band 3



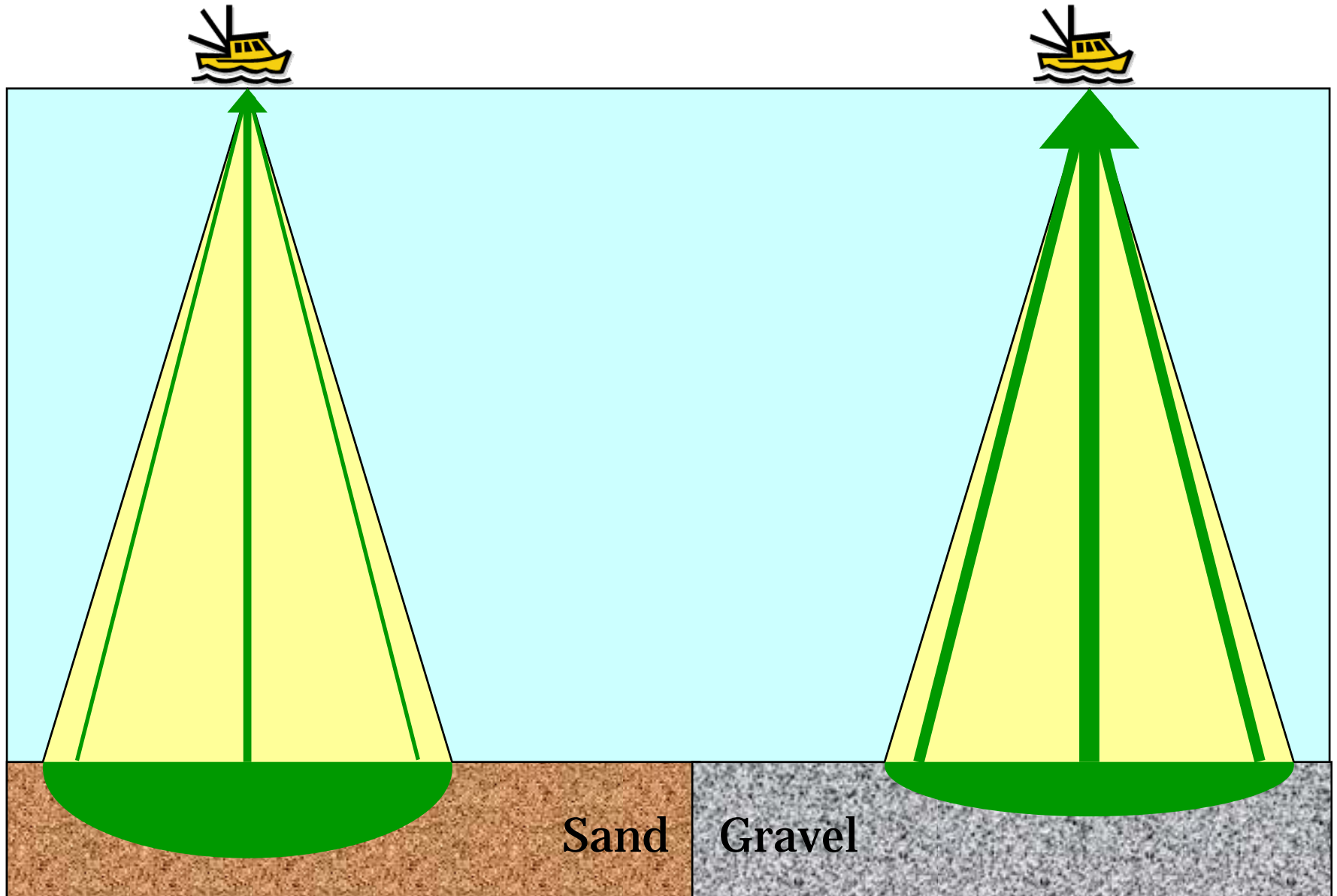
Landsat 7 Band 4



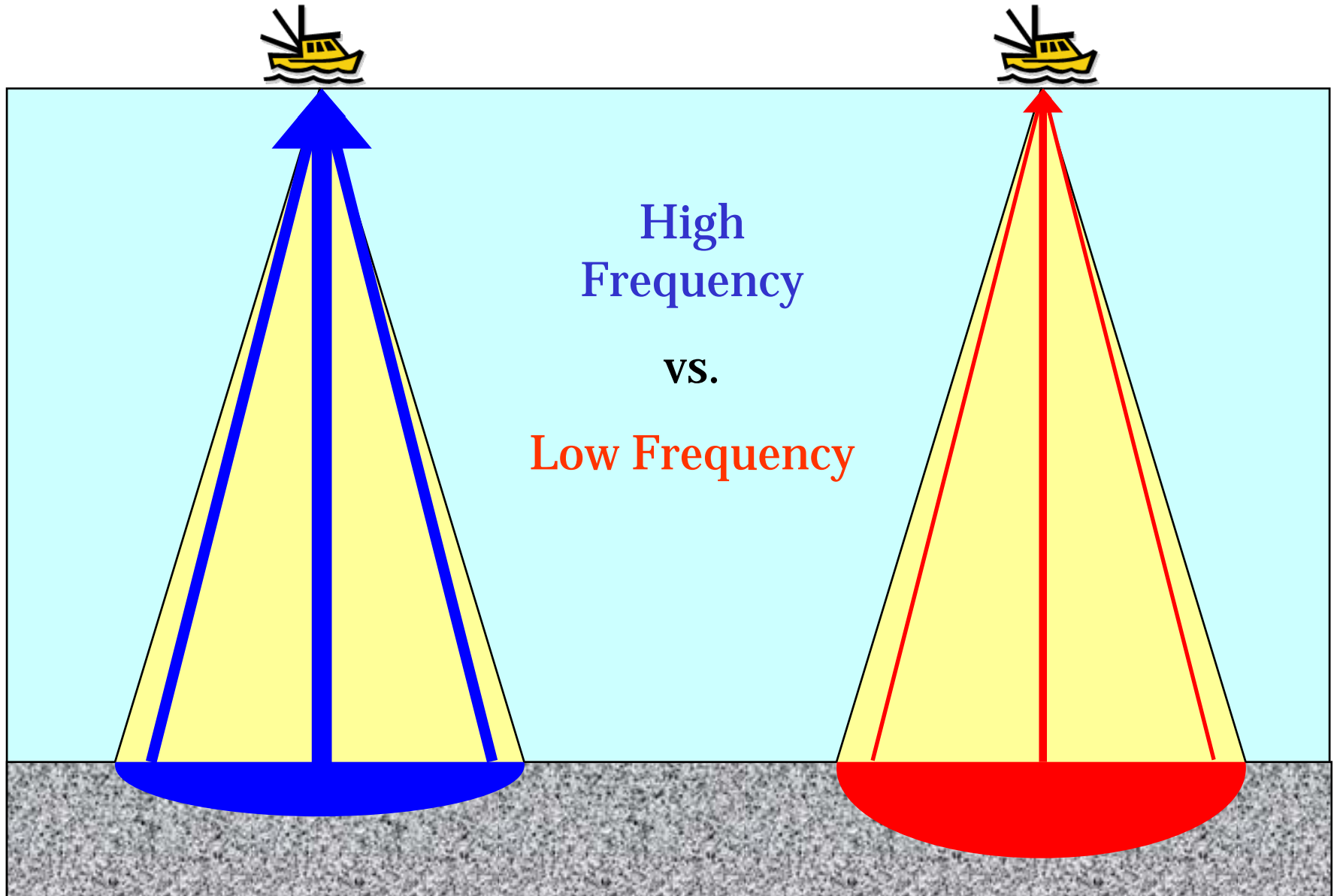
NDVI



Underwater Acoustics



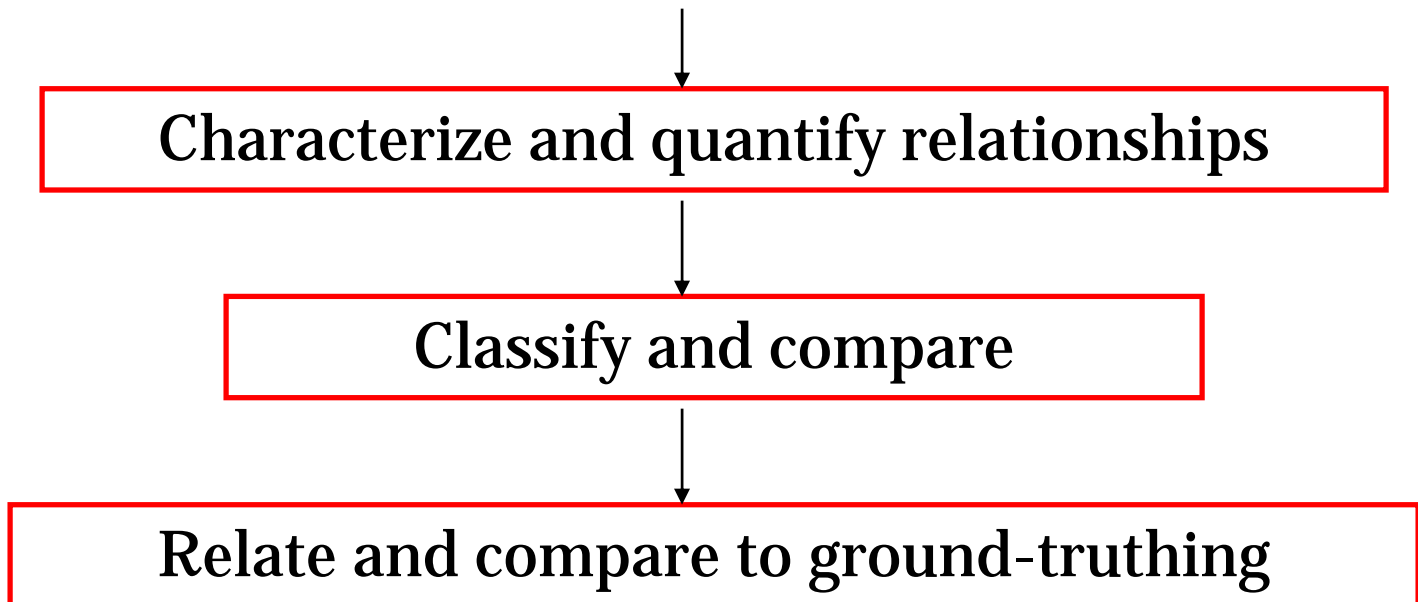
Underwater Acoustics



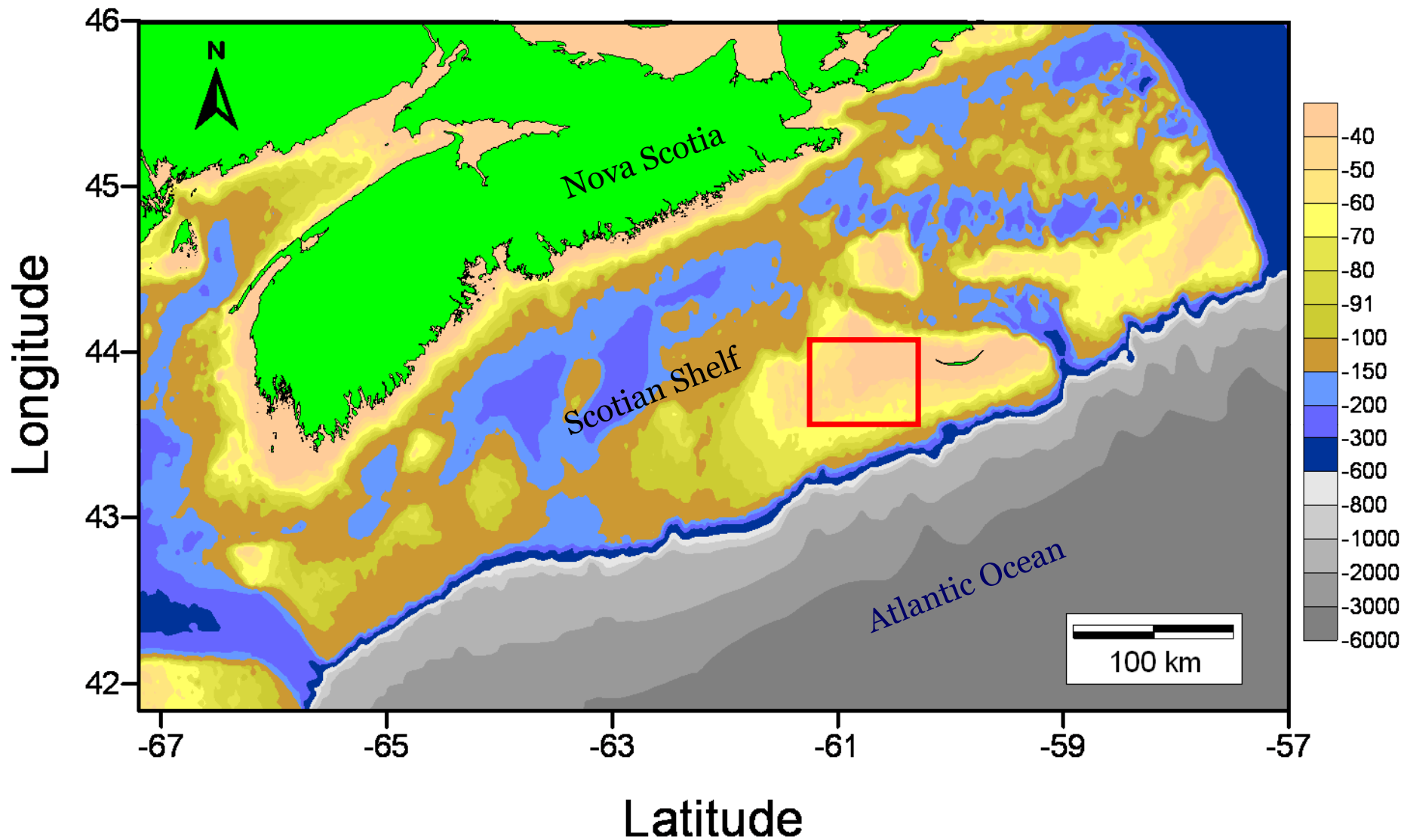
Objectives

- **Main Objective:** Determine whether Acoustic Seabed Classification (ASC) of surficial sediments could be improved using multiple frequencies

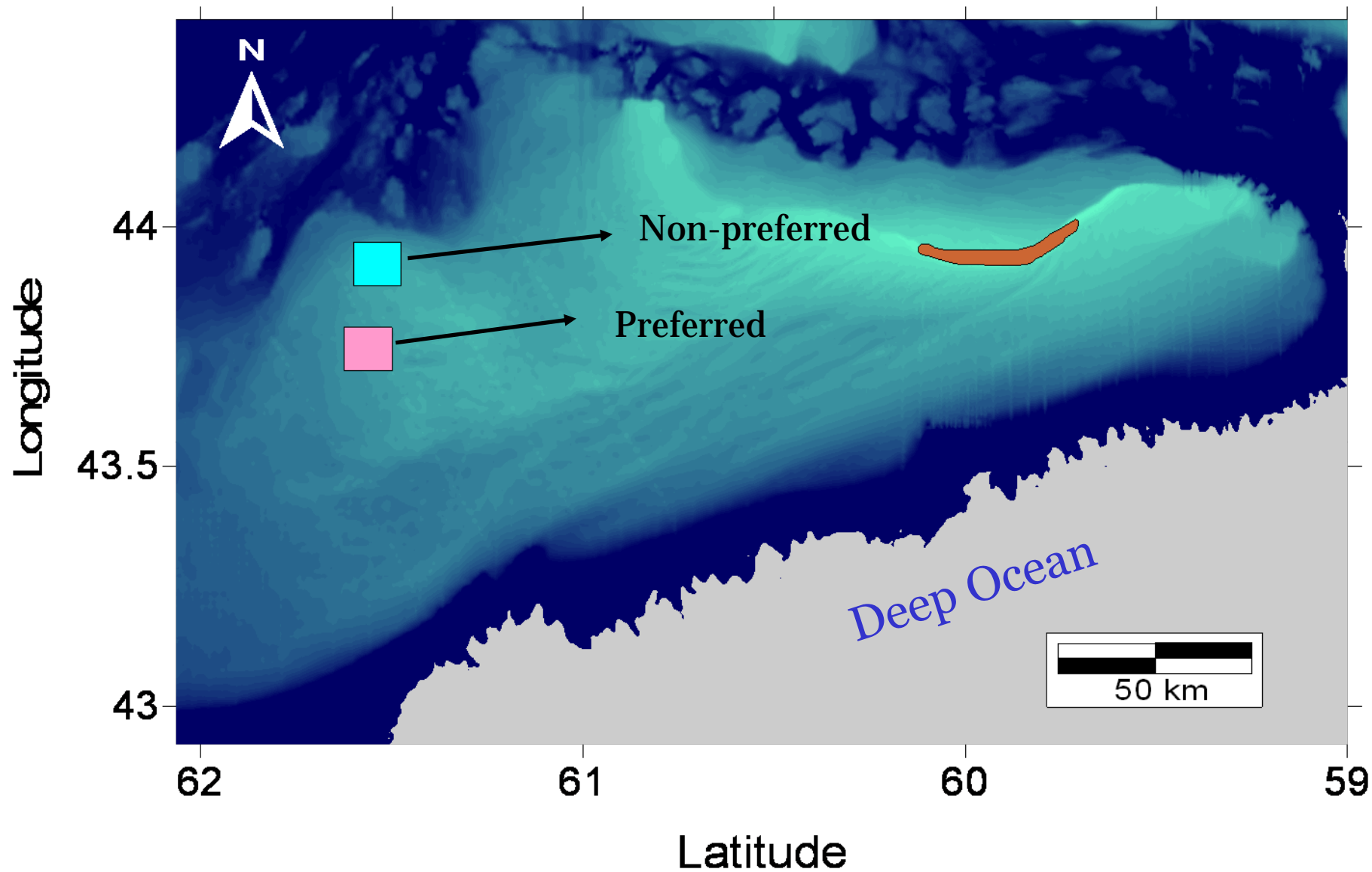
Multi-frequency Acoustic Backscatter



Study Area

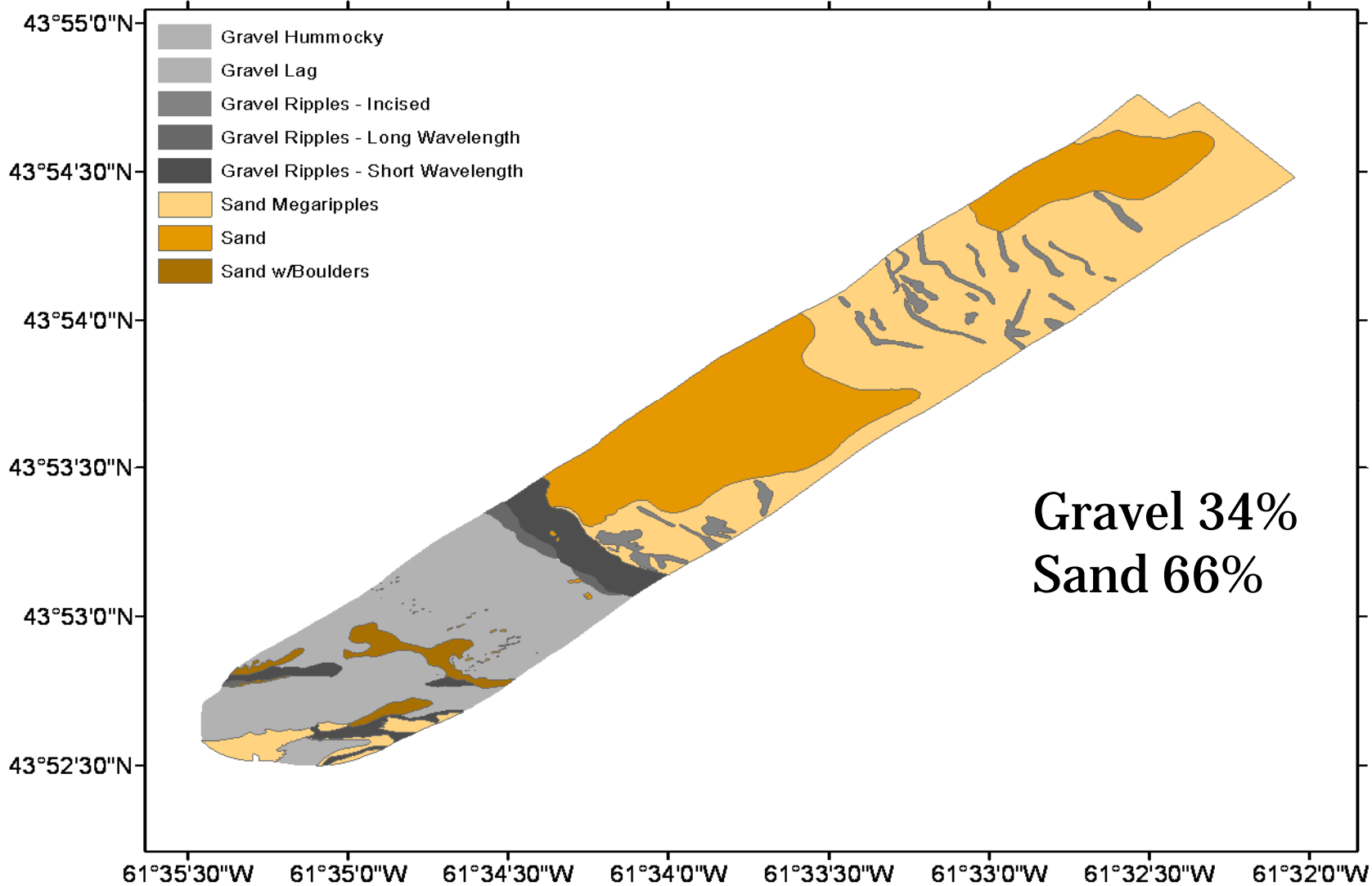


Study Area



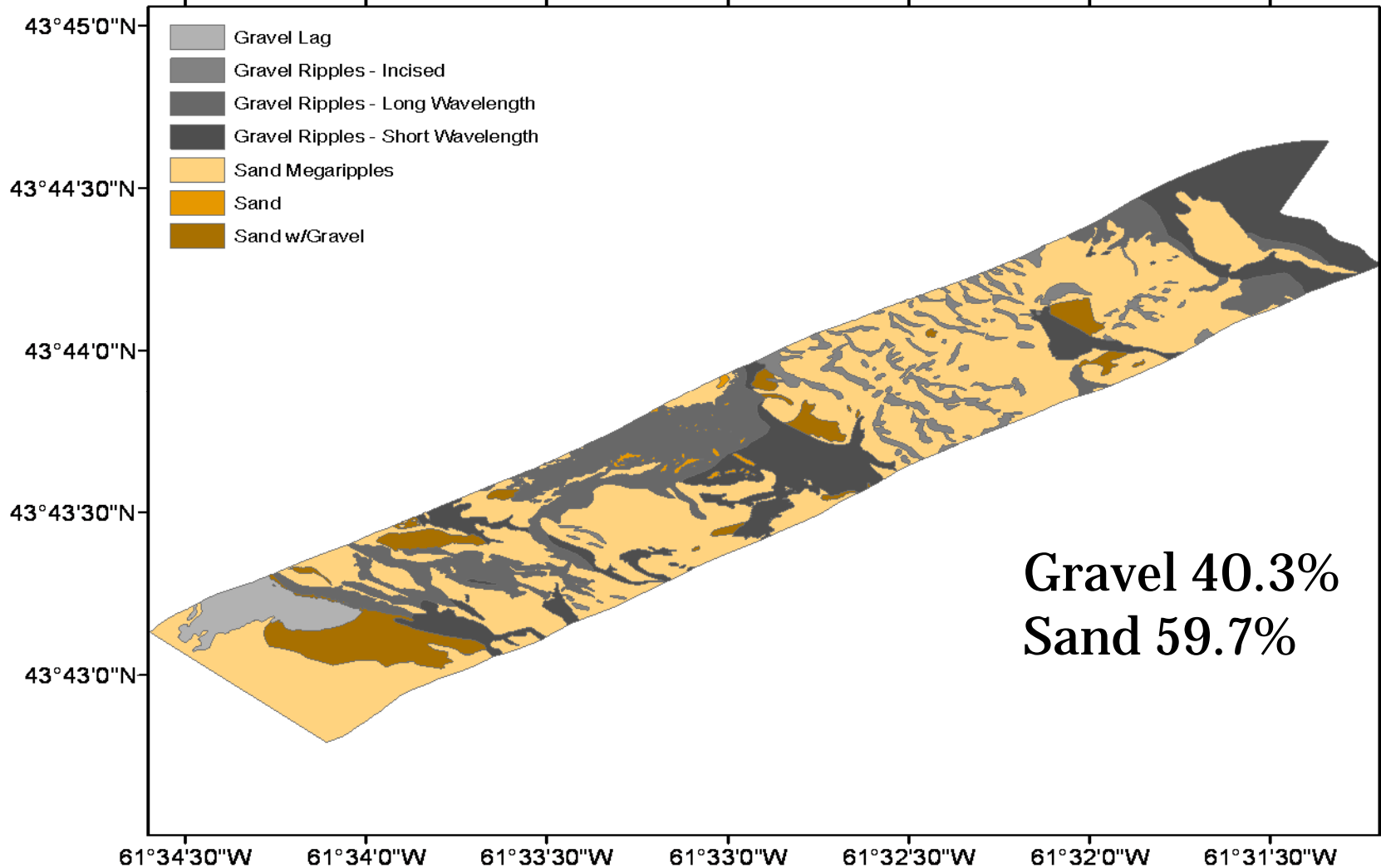
Study Area

Interpreted Sediment Units Non-preferred Study Area



Study Area

Interpreted Sediment Units Preferred Study Area



Methods

Data Collection



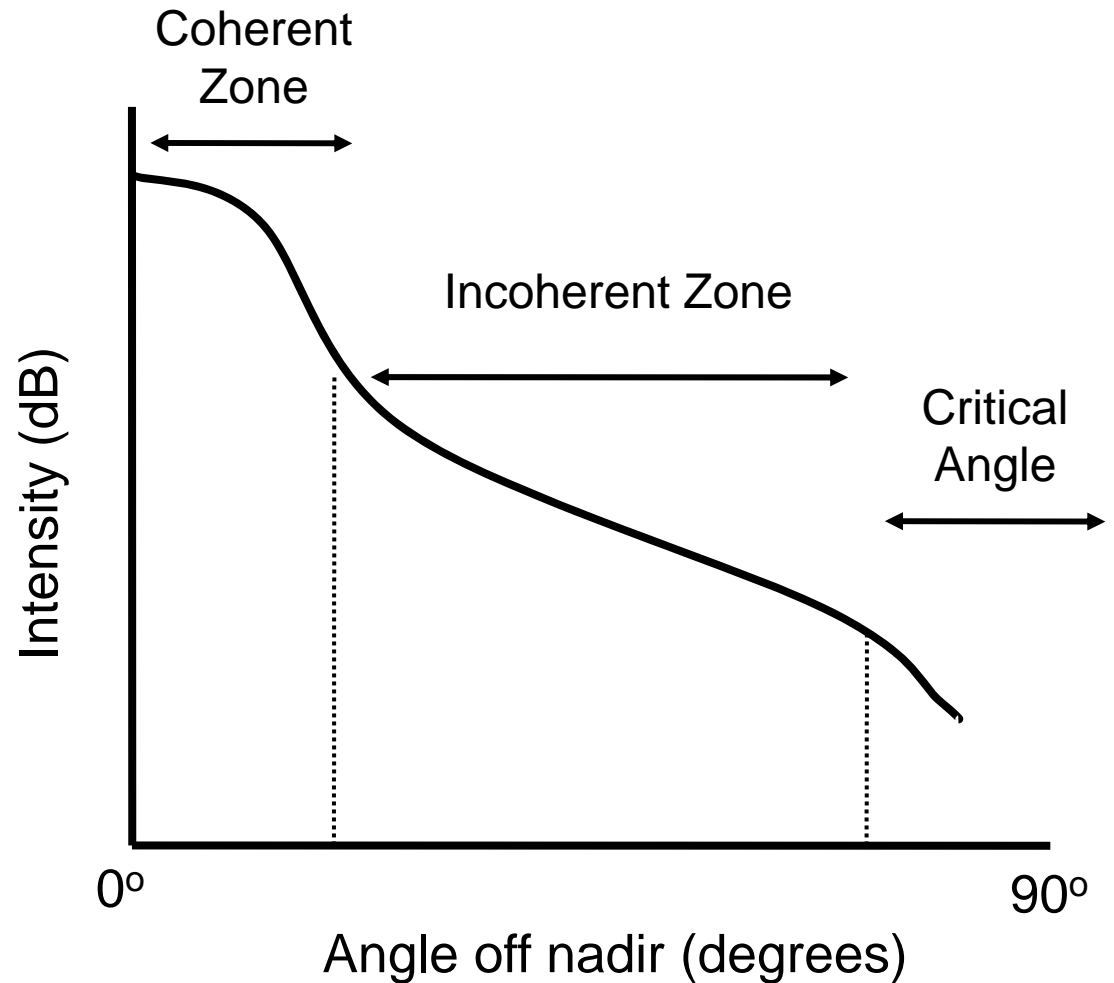
Data Processing



Analysis

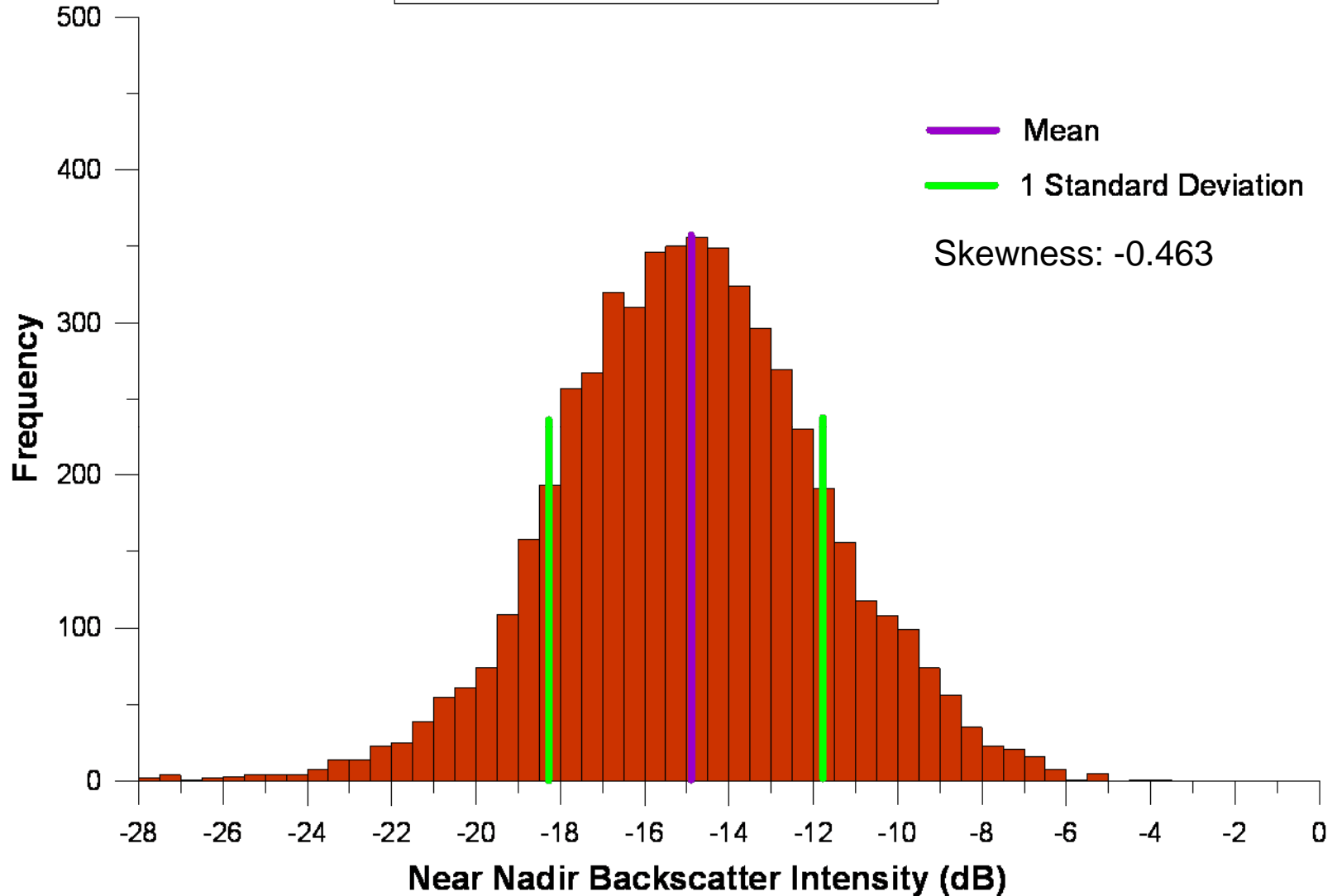


Results / Conclusions



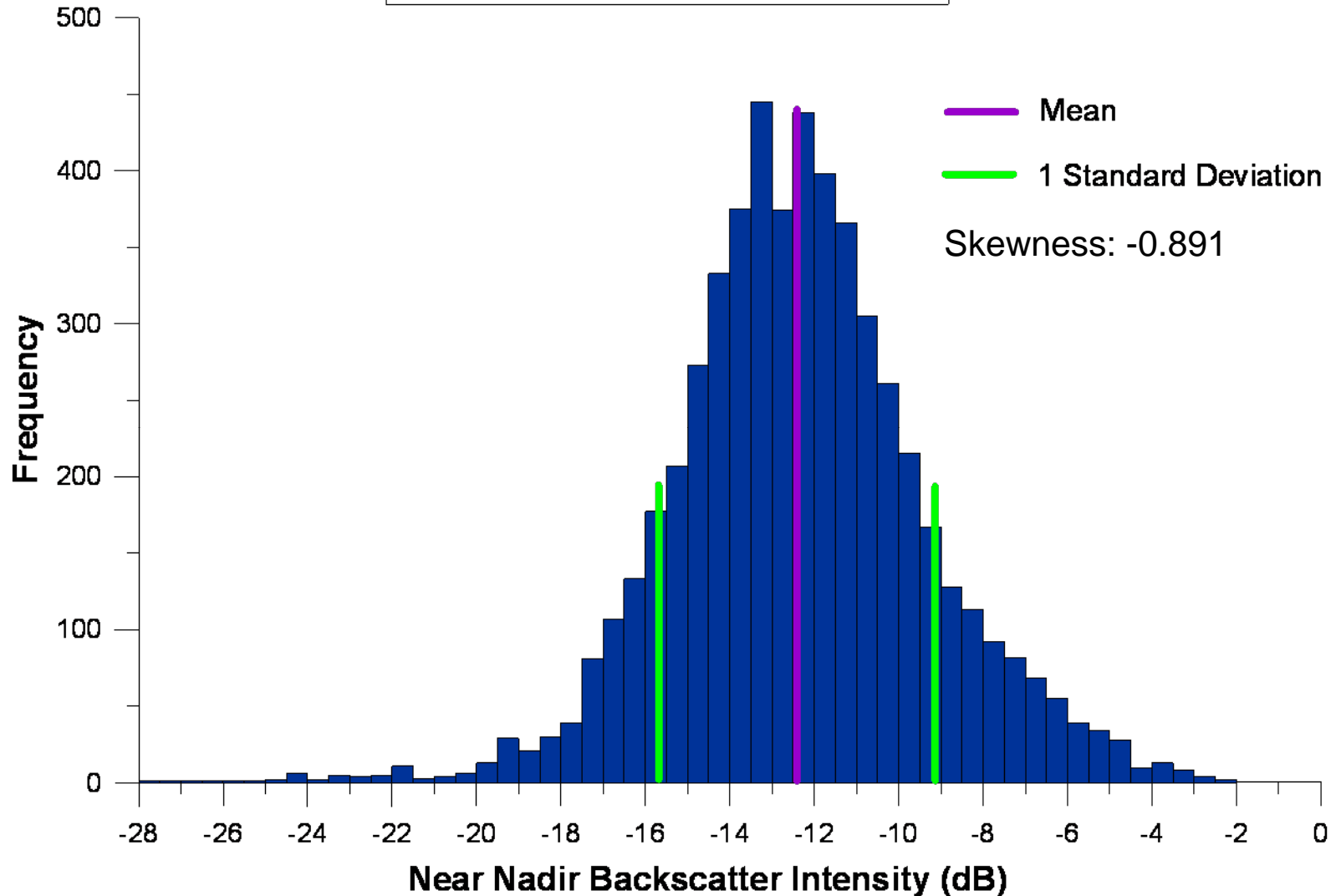
Analysis & Results

Non-Preferred Study Area 38 kHz



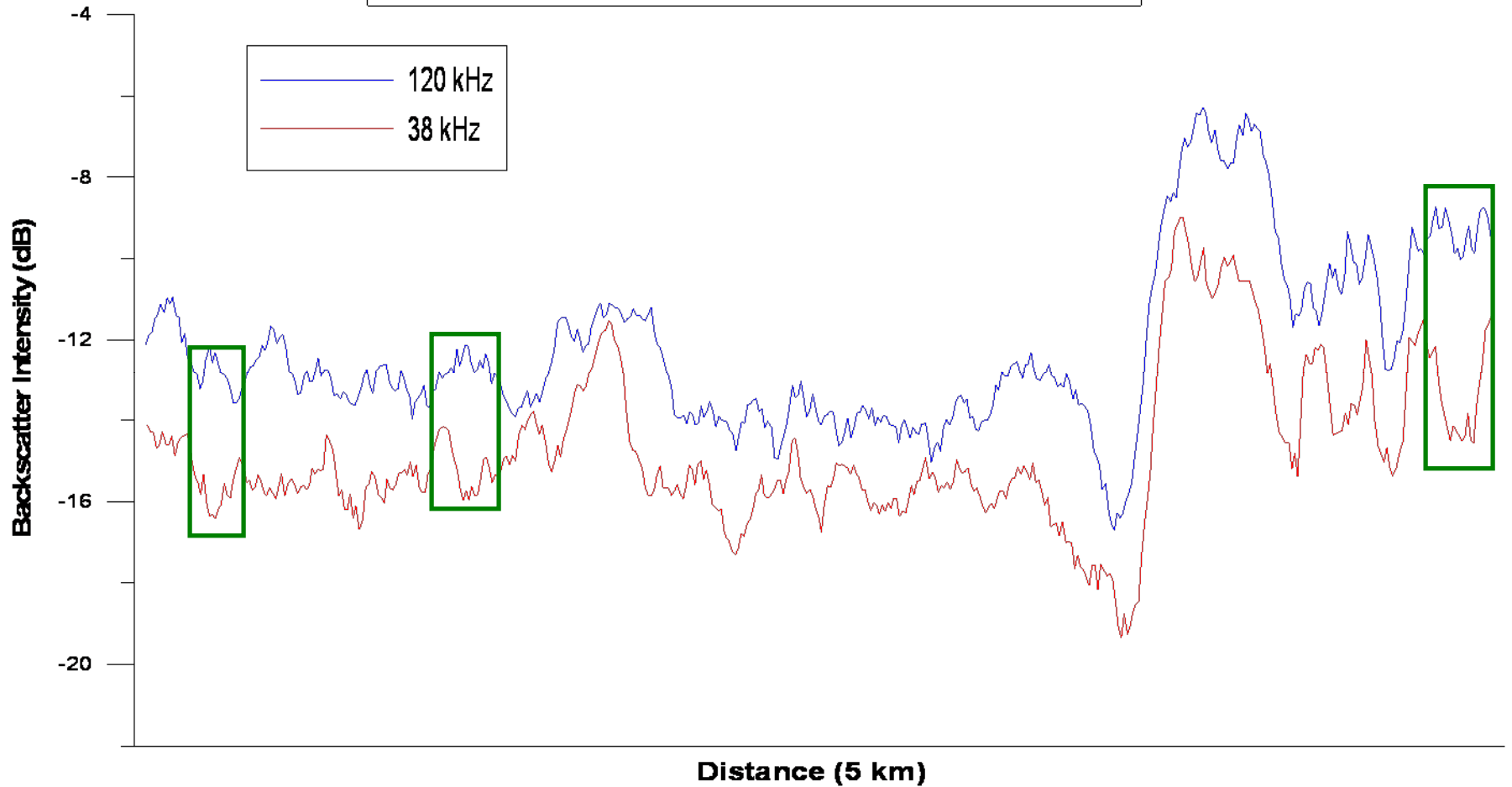
Analysis & Results

Non-Preferred Study Area 120 kHz



Analysis & Results

Non-preferred Study Area - Survey Line 2

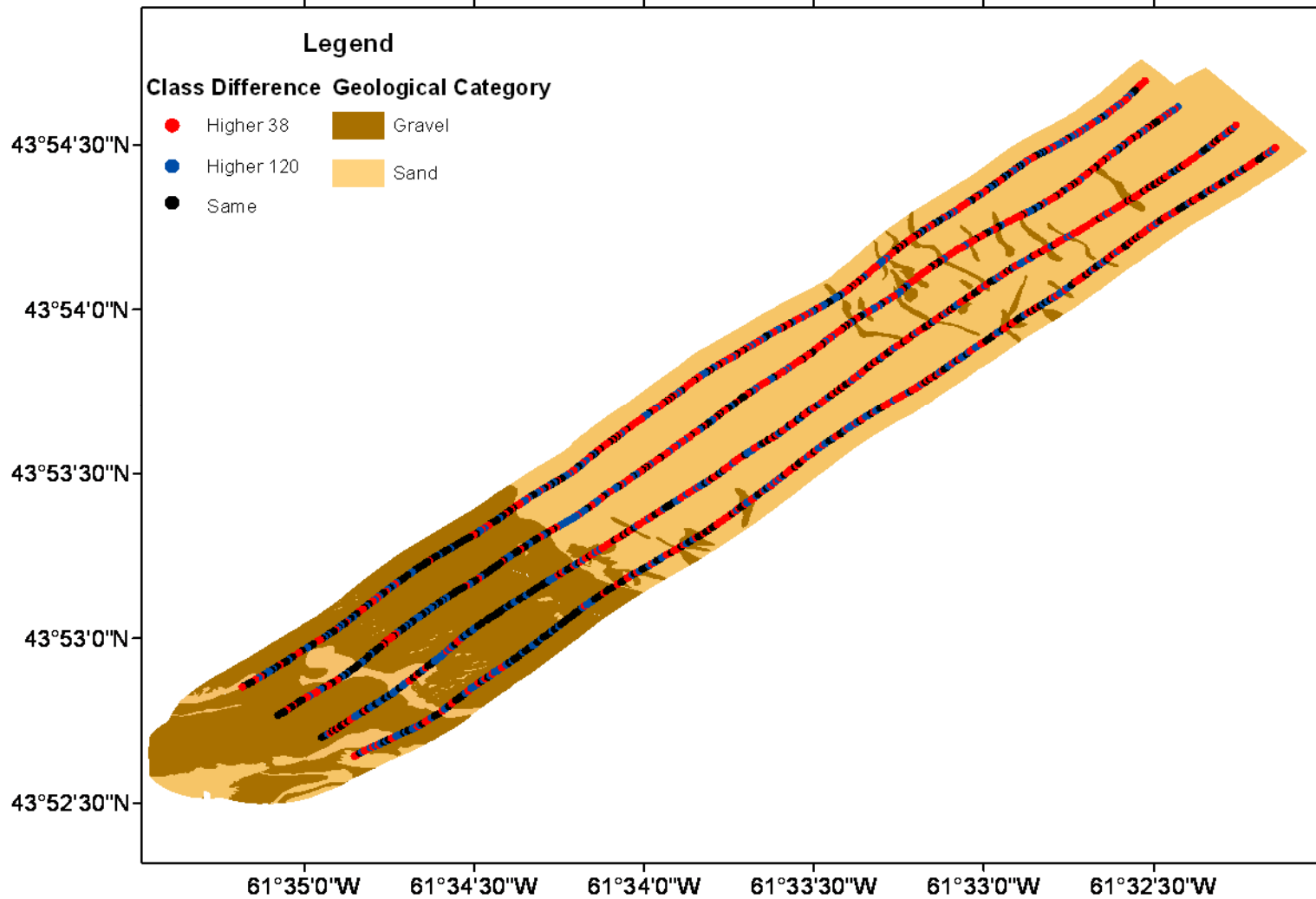


Sand

Gravel

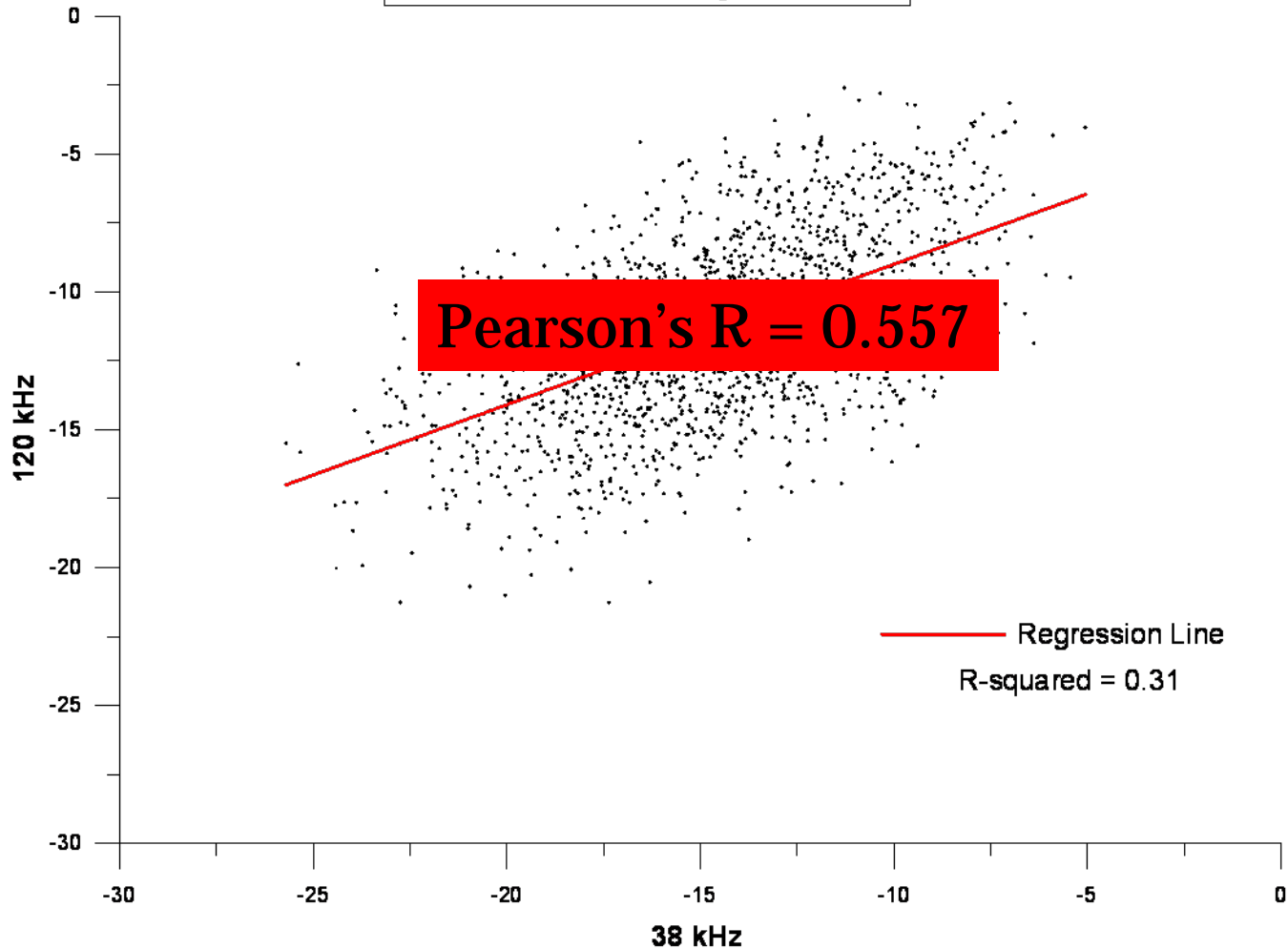
Univariate Classification

Non-preferred Study Area - Differences in Frequency Classes



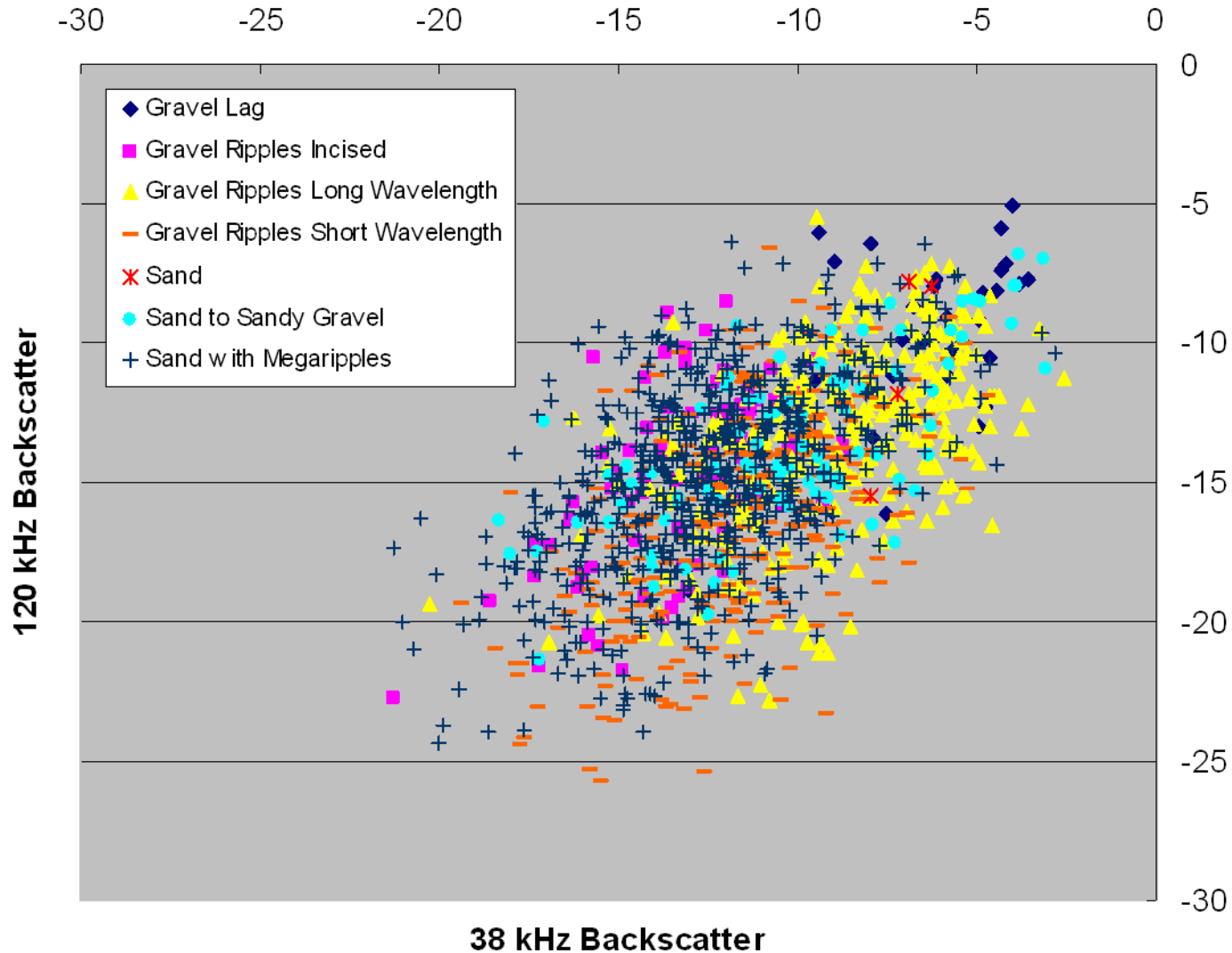
Analysis & Results

Scatter Plot of 4 Survey Lines
Preferred Study Area



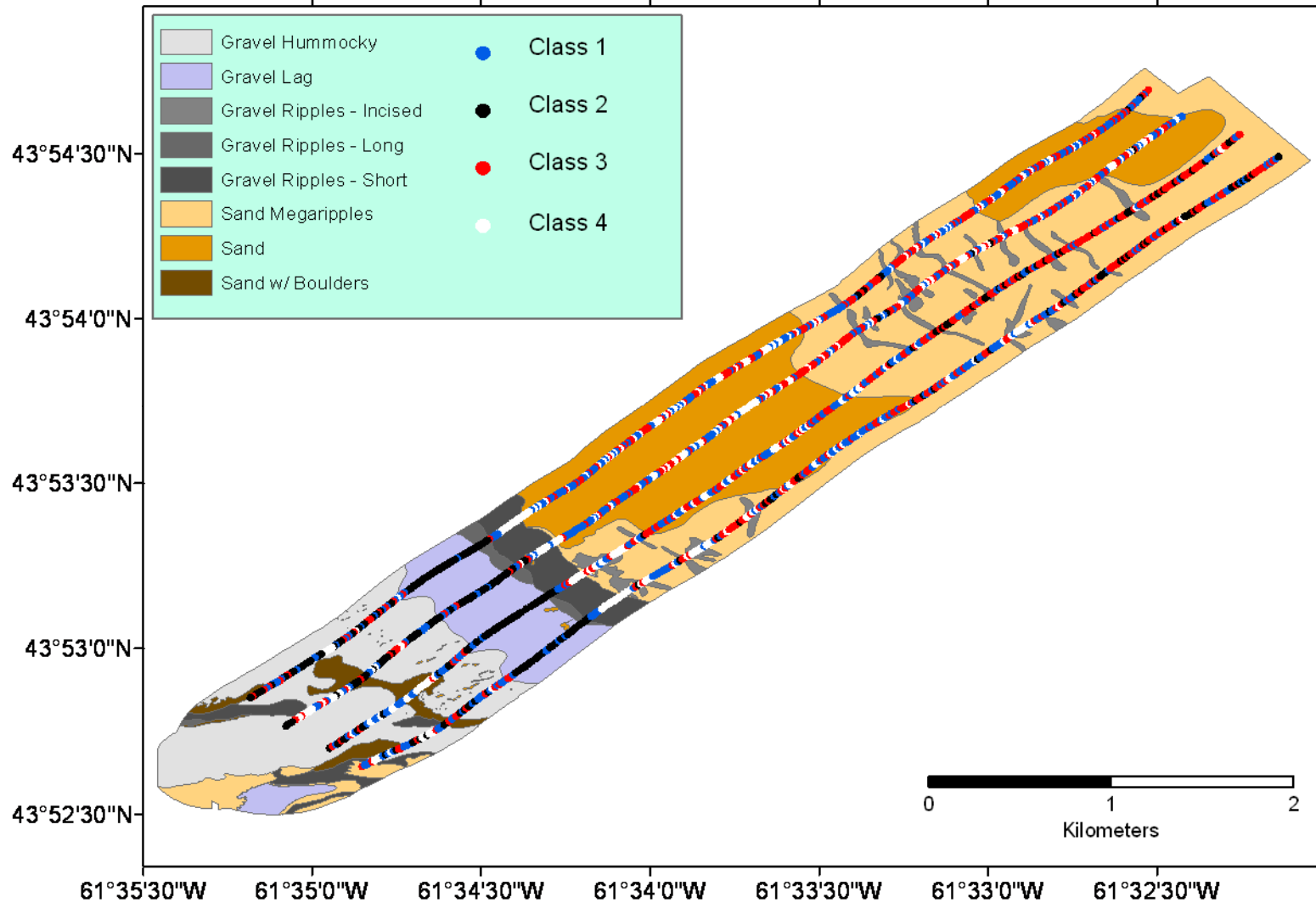
Analysis & Results

XY Scatter Plot of 38 kHz and 120 kHz Frequency Backscatter with Corresponding Seabed Types - Preferred Study Area



Multivariate Classification

K-means Clustering for the Non-preferred Study Area



Preliminary Conclusions

- One of the first attempts to use objective methods to classify sediment types using a multi-frequency underwater remote sensing approach.
- Initial observations suggest that different frequencies show some divergences in their response.
- Expect two frequencies to detect seabed types that are a mix of sand and gravel.
- Further analysis at a more local scale will be required to prove that a multi-frequency approach improves sediment classification.

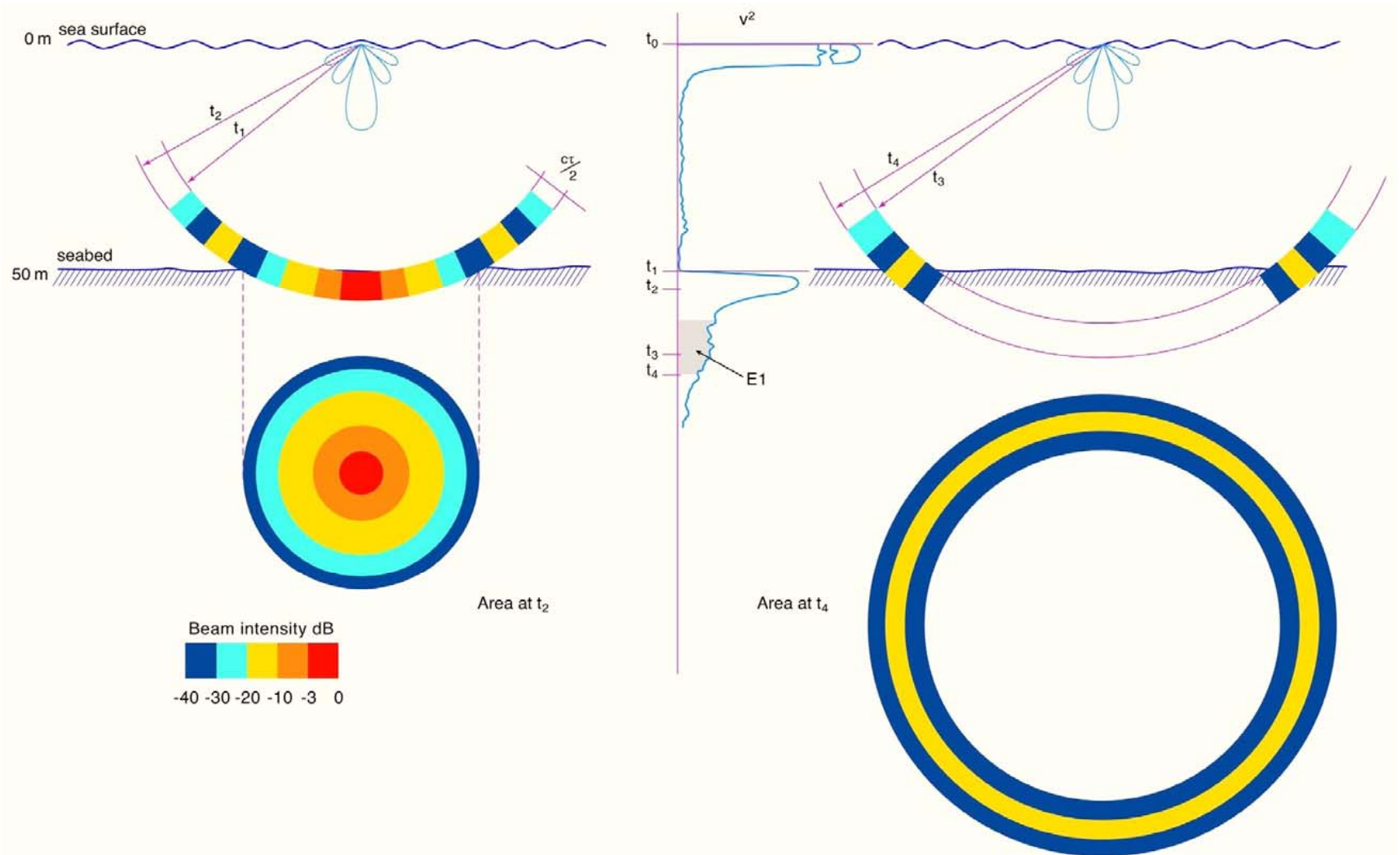
Future Work

- Supervised classifications
- Cross-validate classification results with geological units in order to assess accuracy of classifications
- Interpolate surfaces of backscatter
- Examine classification results with the addition of geomorphology layers (i.e. depth, slope, rugosity)

Thanks for your attention!

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Underwater Acoustics



Source: Kloser, R. (2007). Seabed backscatter, data collection, and quality overview. In *ICES Cooperative Research Report No. 286*, p.48.