Correlation of swath bathymetric images with metrics derived from seismic and sidescan data

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Multibeam EM100 swath bathymetry maps provide a means for identifying regional patterns in seabed morphology. It is hoped that these patterns can be related unambiguously to surficial geology by correlating topography with a number of independently derived parameters, including potential field data and metrics calculated from high resolution reflection seismic and sidescan sonar data. A Geographic Information System is used to perform the correlation.

Metrics derived from reflection seismic data include reflectivity coefficients R1 and R2, and trace-to-trace coherence. The first of these measures the acoustic impedance contrast across the water-seabed interface, and is proportional to the "hardness" of the bottom. R2 measures the energy in the seismic signal following the initial bottom reflection. R2 tends to increase with scattering resulting from significant unresolved seabed roughness (or, microtopography) and with variation in the geometry and lithology of sediments just below the seabed. Coherence is a frequency-dependent quantity which measures the similarity of seismic signals returned from adjacent areas of the seabed. Coherence is strongly sensitive to microtopography.

Metrics similar to the above, but derived from sidescan sonar signals, are also diagnostic of sediment type over the entire sonar swath. These metrics may be used to constrain the interpretation of topographic features, for example, by helping distinguish bedrock outcrop from glacial moraines. The tasks of preparing metrics, correlation and interpretation are forms of feature classification. A number of simple neural networks have been implemented to assist in the process.