A comparision of swath bathymetric data and sidescan sonograms from the inner Scotian Shelf off Halifax

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During 1991, a cruise of CSS Dawson collected a grid of high-resolution seismic reflection and sidescan sonar data, together with cores, surficial grab samples and bottom photographs in an area of the inner Scotian Shelf off Halifax. The area was surveyed in 1992 by the Canadian Hydrographic Service with a SIMRAD EM100, multibeam sounder system from the CSS Matthew. The multibeam bathymetric mapping provides 100% coverage of the seabed, presenting images similar to aerial photographs on land. In contrast, regional seismic and sidescan survey tracks are normally spaced from a few to tens of kilometres. The conventional sidescan sonar provides textural information on the composition of seafloor materials as well as information on surface morphology. A comparison of the two data sets provides a test of the capabilities and limitations of different imaging systems for seabed mapping. The resolution of these remote sensing systems must be understood and carefully compared.

Sidescan sonar and seismic reflection systems provide information not available from the swath bathymetry data alone. Areas of the swath bathymetric map that appear flat and featureless can exhibit a wide range of varying sediment textural distributions, dynamic features and microtopographic relief on sidescan sonograms. These include areas with complex distributions of starved megaripples, gravel and sand patches often with boulders, and exposed bedrock with broad flat unconformities developed across outcropping beds. Terrains that appear to represent outcropping bedrock on the swath bathymetric data, can appear on sidescan sonar imagery as boulder mantled till. Seismic reflection data indicate that this seabed relief arises from a mimicking of the subsurface morphology of the buried bedrock surface. A large shipwreck appears on the bathymetric data as two isolated topographic highs and would not be interpreted as a shipwreck from the bathymetric data alone. Sidescan sonar imagery shows details of the shipwreck including rails, deck flow lines, and superstructure elements including stacks and masts. Scour depressions in the seabed around the hull show on both data sets.

The geological interpretation of the swath bathymetric images must be carefully integrated with information on seabed sediments and bedrock provided by seismic reflection, sidescan sonar data and samples. The 100% seabed coverage of the swath bathymetry provides the essential data for correlation of geological characteristics between survey tracks and a continuity capability never before attainable. As such, the swath bathymetric mapping is a new and important tool to be added to the existing methods for seabed mapping.