Interactive 3D Visualization of Marine Depositional Systems at Multiple Scales

Lindsay J. Gee[1], Larry A. Mayer[2], and James V. Gardner[2]

[1]IVS 3D Inc., 325 Corporate Dr., Ste. 175, Portsmouth, New Hampshire 03801

[2]Center for Coastal and Ocean Mapping, University of New Hampshire, 24 Colovos Rd., Durham, New Hampshire 03824

ABSTRACT

Marine geologists have for generations compiled their data by hand, sometimes while at sea, sometimes months after a cruise. The convergence of advanced multibeam sonar mapping systems with enhanced computer technology has enabled today's marine geologists to collect large volumes of data, 24 hours a day, for weeks at a time to generate spectacular maps that can be visualized in 3D within a few minutes. Multibeam bathymetry, multibeam acoustic backscatter, and high-resolution subbottom echosounder data can all be combined with previous data, whether scanned or digitally generated maps, charts, etc.

Over the past four years, researchers at University of New Hampshire have mapped a range of depositional environments at scales from basin-wide to centimeters. More than 162,000 km^2 (62,500 mi^2) of the Gulf of Alaska seafloor was mapped in 2005 that show a scale of depositional systems that ranges from large submarine fans to bedforms that ornament levees. Combining bathymetry with coastal Alaska topography provides a broad overview of the data for geologists to interpret. Acoustic backscatter draped over bathymetry offers another level of detail and provides information about the seafloor character, such as roughness and sediment type. However, the new views expose unexpected and unexplained features, such as the intricate details of fan development, the meander behavior of submarine channels, the presence of plunge pools and cascades, etc.

Using the same approach with higher frequencies in shallow water off Martha's Vineyard, 2-3 cm (1-1.5 in) high ripples can be resolved, and the dynamics of ripple and sand-body movement was documented in response to changes in prevailing wind directions and storm events.

Intermediate-scale sedimentary depositional systems have been mapped on the U.S. Atlantic margin, in the Gulf of Mexico, along the Barrow, Alaska, margin, and on the insular slopes of the West Mariana Ridge in the western Pacific.

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