Exploration of a Major Methane Hydrate Province in the Hudson Canyon Region: An Ocean Frontier Adjacent to the New York-New Jersey Metropolitan Area

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Methane hydrates extend at least partially beneath the Hudson Canyon region, as indicated by bottom simulating reflectors about 500 meters below the seafloor on seismic reflection profiles of portions of the continental slope and rise (Dillon et al., 1995). Our synthesis of prior multidisciplinary collaborative investigations of this region, and results of our participation in the NOAA Ocean Exploration Program 2001 Deep East Hudson Canyon expedition (Figures 1 and 2), reveal a history of ongoing dynamic processes inferred to result from methane disassociation. These processes include active venting of methane from discrete zones between the outer continental shelf (200 m water depth) and the middle continental rise (3500 m water depth) indicated by geochemical profiles and bottom surveys, and evidence of slope failure on scales from local to regional (Rona et al., 2000).

Slope failure occurs in the form of slumping of apparent Eocene chalk from the base of the continental slope onto the upper rise inferred to have been driven by fluid pressure (Dugan and Flemings, 2000), and ongoing gravitational gliding of strata at low seafloor inclinations (~1^{o}) on the rise explained by destabilization of sedimentary strata by fluid pressure (liquid and gas) trapped within the strata (Rona, 1969). The release of methane in the Hudson Canyon region has the usual implications as a contributor to climate change, and as an energy source for the possible presence of chemosynthetic ecosystems. Specific to this region as a hub of trans-Atlantic fiber-optic cables offshore the New York-New Jersey metropolitan area (Figure 3), the trapped fluids and evidence of fresh slumps and glides have implications for the recurrence of mass gravitational movements that could disrupt the nexus of seafloor communications cables.

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Figure Captions for Rona et al., Exploration of a Major Methane Hydrate Province in the Hudson Canyon Region: An Ocean Frontier Adjacent to the New York-New Jersey Metropolitan Area

Figure 1. A poster of the Deep East 2001 cruise sponsored by the NOAA Ocean Exploration Office showing a 3D bathymetric reconstruction of the Hudson Canyon region extending from the Hudson River in New York-New Jersey harbor, across the adjacent continental shelf, slope and rise into the deep ocean basin (bathymetric reconstruction courtesy of Peter Sloss, NOAA National Geophysical Data Center). Fluid pressure (liquid and gas) related to methane hydrates, which at least partially underlying the continental slope and rise (Dillon et al, 1995), is inferred to induce extensive mass gravitational movements observed in this region (Rona et al., 2000).

Figure 2. Physiographic map of the Hudson Canyon region (courtesy of Peter Sloss, NOAA National Geophysical Data Center) showing DSV ALVIN dive sites and sampling stations of the Deep East 2001 Hudson Canyon expedition.

Figure 3. Map of Atlantic undersea fiber-optic cable routes (courtesy of KMI Corporation, Ocean News and Technology, July-August 2001), showing nexus of cables offshore the New York-New Jersey metropolitan area.