AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Geophysical Characterization of Potential Long-Core Sites for Northern Gulf of Mexico Gas Hydrate Studies

Investigations of naturally occurring gas hydrates on the upper to middle continental slope of the northern Gulf of Mexico have included high-resolution seismic-reflection surveys and shallow subbottom sampling with seafloor cores. The seafloor cores provide direct evidence for widespread occurrence of gas hydrate deposits within a few meters of the seafloor, but do not give information on hydrate continuity or distribution in the gas hydrate stability zone (HSZ). During 1998 and 1999, the U. S. Geological Survey acquired over 1600 km of high-resolution seismic-reflection profiles across the upper continental slope to investigate the distribution and concentration of hydrate deposits. These data show basin-ridge structures with complex shallow stratigraphy that includes layered and chaotic units cut by high-angle faults, which are associated with salt diapirs and active submarine landslides. The bottom simulating reflection associated with inferred gas hydrate deposits on other continental margins is absent on these data; however, reflection-amplitude anomalies that we interpret to result from free gas and possibly gas hydrate are common. To confirm these interpretations and to correlate the geophysical data with suspected hydrate occurrences, continuous coring of the HSZ is required.

The USGS proposes to collaborate with government, industry, and academic partners and collect giant piston cores up to 50 m long, to sample the uppermost part of the HSZ on the northern Gulf of Mexico continental slope. Coring sites will be focused in areas of structure (e.g., ridges, mounds, faults) where nearby hydrates are known from shallow seafloor cores, as well as in areas where hydrates are not commonly found but are suspected (e.g., basin-flank slumps, channel debris flows, compaction flow-structures). Transects of cores across such features should help delineate subsurface occurrence and distribution of natural gas hydrates.