



MAP CODE: P7

Gas Hydrate Samples

Reference: Brooks, J.M., Field, M.E., and Kennicutt, M.C. II, 1991, Observations of gas hydrates in marine sediments offshore northern California: *Marine Geology*, v. 96, p. 103-109.

Geographic/Geologic Location:

Pacific Ocean

Eel River Basin, a late Cenozoic forearc basin

Offshore from northern California, upper slope sediment

Piston coring at seven locations

Core/Sample Count: 7 cores

Latitude/Longitude: ~40°50'N/~124°35'W

Water Depth: 510-642 m

Sediment Depth: 0-2.8 meters below sea floor (mbsf)

Description of Gas Hydrate: “The gas hydrates were recovered from sediment that was dominantly mud. The upper 0.2 m of core ER-10 (1.8 m long) consists of light to medium gray dolomitic mudstone containing fauna of indeterminate age indicative of an upper to middle bathyl paleoenvironment (upper to middle continental slope, ~500-1500 m). Two gas-hydrate nodules were observed near the bottom of the core at 1.6-1.8 m; the core was gas-fractured below 1.0 m, possibly indicating the presence of dispersed hydrate between 1.0 and 1.6 m.

Gas hydrates locally occur very close to the seafloor surface. Core ER-82, only 0.3 m long, contained numerous gas-hydrate crystals and a gray mudstone (top 2-3 cm). . . . Dispersed hydrates were present in an adjacent core (ER-83), 1.5 m long that consisted of fine gray sand and silt.

In some cores, gas hydrate was found in layered bands within a mud matrix, such as in core ER-105 (0.3 m long; hydrate in top 0.2 m). . . . Layering of the hydrate was particularly evident in core ER-148 (1.8 m long) which had fractures due to gas expansion and contained hydrates throughout. One of the longer cores (ER-202) contained layered gas hydrates from its bottom at 2.8 m up to 2.2 m, but gas fractures between 2.2 and 1.4 m may indicate the presence of dispersed hydrates within that interval. . . . Another long core (ER-139) also contained gas hydrate, in the form of large nodules, in its lower part (1.8-2.0 m).”



Analytical Results: “Hydrogen sulfide, detected by smell, was present in all the gas-hydrate-containing cores.... The recovered gas hydrates consist mostly of methane and only trace amounts of ethane. The carbon-isotopic ratio of the methane ranges from -57.6 to -69.1% . Only one sample contained sufficient ethane for carbon-isotopic analysis ($\delta^{13}\text{C} = -27.1\%$).”

Inferred Evidence for Gas Hydrate: The gas-hydrate zone, inferred from bottom-simulating reflectors (BSRs), extends for more than 130 km along the California margin and probably continues onto the Oregon margin. “The BSR that defines the base of the gas-hydrate zone is easily recognizable on E-W seismic-reflection records in most of the area; however, it is poorly expressed offshore of Eureka, probably owing in part to the marginal quality of the seismic-reflection records. The BSR is best developed on the Eel and Klamath Plateaus at water depths of 800 to 1200 m, and it is traceable offshore onto the lower slope (2000-m depth). Strata of the Eel River basin are essentially flat lying landward of the 800-m isobath, and so the BSR is difficult to trace; however, limited data document its continuity into shallower waters.” The depth of the BSR is typically 225 m below the seafloor and in places as much as 315 m.