

RESULTS FROM FIRST DIRECT OBSERVATION AND SAMPLING OF A GULF OF MEXICO BASIN FLOOR SALT DOME, GREEN KNOLL

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ABSTRACT

In April 1990 DSV ALVIN, the deep-diving research submersible, was used to investigate the lower continental slope and adjacent basin floor off Louisiana. Green Knoll, a salt diapir with over 400 m relief above the flat-lying Gulf bottom, was a focal point of interest in the dive program. The dome is seaward of the Sigsbee Escarpment in the Walker Ridge lease block area. Seismic profiles run across this feature suggest salt at or near the sea floor. Although salt exposures were not observed, a brine pool and several active seeps were found on the east side near the crest of the dome where seismic data suggested exposure or near exposure of salt. A brine layer ~12 feet thick collected in a bowl-shaped depression with steep sides. The feature was interpreted to be the result of a large sediment failure which created a cirque-like depression. Brine seeps originated in the steep walls of this feature presumably near the salt core of the dome. Elevated sodium and chloride levels in the brine suggest an origin related to the dissolution of salt. Downslope transport of brine (salinity to 7.2 x higher than normal GOM water) from these seeps created drainage patterns similar to braided streams. These transport pathways were floored by bright red/orange sediments, presumably oxidized iron-rich clays.

Sediment evacuation scars, gullies, shattered and deformed sediment masses, vent-like dewatering structures, stress fractures/cracks associated with incipient failures, and exaggerated slopes linked to recent episodes of mass movement were all common features of the dome flank and crest. This family of features emphasizes the importance of mass movement processes to the current configuration of the dome. Hydrocarbon seeps and commonly associated chemosynthetic communities plus authigenic carbonates were not found on top or upper flanks of the dome.

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