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FINAL REPORT
PROJECT NUMBER: UNCW9230 PI: Roberts
OBJECTIVES: Our research continued testing to deeper depths our original hypothesis that reef-like carbonate structures on the shelf and upper continental slope in the northern Gulf of Mexico are actually the by-products of microbial breakdown of hydrocarbons and that biological communities will systematically change with depth and relative rate of hydrocarbon seepage. Our objectives are becoming more focused and at the same time more diverse with each dive season. In 1992, we contrasted mud mounds/vents of the upper slope with hydrate mounds of the mid slope. In addition, microbial productivity within and between seep sites were of special interest in 1992. Authigenic carbonate production at sites of varying microbial productivity were investigated.
METHODS: Tasks included: 1) locate a central topographical feature and place a marker pinger; 2) conduct up-slope, down-slope, and cross-slope surveys with discretionary geological and biogeochemical sampling; 3) conduct slurp gun and push core sampling; 4) select sampling for petrographic and carbonate mineralogy analyses; 5) collect faunal samples with associated substrate. Other methods included scanning electron microscopy, x-ray radiography, x-ray diffraction, petrology, and in-situ experimentation. The individual dive sites were selected on review of high resolution acoustic data sets provided by industry.
RATIONALE: The Department of Interior recently closed several lease blocks in the Northern Gulf of Mexico because of the presence of chemosynthetic hydrocarbon seep communities. Associated organisms, particularly chemosynthetic bacteria, not only provide nourishment for symbiotic hosts but may provide the mechanism for modern formation of carbonate lithoherm structures. Location of the structures and communities may be used as indicators of underlying hydrocarbon reserves. In addition, carbonate mounds and other hard substrates present operational hazards for pipeline routing and production platform locations on the continental slope.
ACCOMPLISHMENTS: Considerable time and effort was applied to acoustic data sets (high resolution and side-scan sonar) prior to this year's dives, so that each dive would have a high probability of sampling success. The data were supplied by various companies in the petroleum business. These data sets are initially used for evaluation of geohazards for production platform sites and pipeline routings. We selected specific features from these data in three (3) lease block areas of the Louisiana continental slope; Garden Banks, Green Canyon, and Mississippi Canyon. Although we experienced surprises, our dives this year were both efficient and very productive. The sub equipment worked well and the samples collected were excellent. Specific results and their significances are: 1) Recovered experiments that were deployed one (1) year ago. These experiments will provide insight into the precipitation/dissolution of carbonate substrates and types, plus stratigraphic distribution of microbial communities at seep sites. We put our experiments at two (2) separate locations, but one set of experiments at the edge of an active mud vent could not be found. The other site was a hydrate mound. All experimental substrates from this site were recovered; 2) Confirmed depth dependency of various seep-related carbonate features I originally found and mapped using high resolution acoustic data; 3) Critical sampling was carried out to improve our knowledge of hydrocarbon seep features and processes of the upper continental slope; 4) Samples were acquired to initiate new research programs on microbial productivity of c" seeps and responses of microfauna (foraminifera) to both seeps and :~ seep-related areas of the sea floor.
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BENEFITS: Data gathered during this cruise provided the basis for two PhD's and one MS research requirements. In addition, the 1992 data sets will

significantly enhance our understanding of both the geology/geochemistry and biology of the upper continental slope, especially with regard to areas where hydrocarbons are seeping to the modern sea floor. It is anticipated that two publications will immediately result from new discoveries on this cruise. The manuscripts will be sent to "Science and Geology". Many other publications are possible once data sets are thoroughly analyzed. Our substrates left in-situ for one year should provide data for two additional papers (Journal of sedimentary Petrology and Microbiology).