LINKS BETWEEN AMPLITUDE ANOMALIES (MULTICHANNEL SEISMIC DATA) AND SEA FLOOR FEATURES IN AREAS OF HYDROCARBON SEEPAGE, LOUISIANA SLOPE

by
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ABSTRACT

High quality 3-D seismic data from the Green Canyon area (Blocks 53, 185, 272) were used in conjunction with direct sea floor observations/data collection by research submersible to help establish the links between seismic signature and sea floor response in a setting characterized by hydrocarbon seepage. Amplitude extraction maps of surface and near-surface horizons were compiled from digital 3-D seismic data. They were useful in horizons showing the area, configuration, and relative anomaly strength which provided a target field on which to select and prioritize submersible dives. In areas where 3-D seismic data were acquired, the amplitude extraction method offered a quick indicator of potential seeps, their relative activities, and the probability of encountering chemosynthetic communities and other features commonly associated with seeps. The 3-D seismic data also offered more complete surface and near-surface coverage of a seep area than conventional high resolution acoustic data used for shallow geohazard evaluations.

Sea floor expressions of the sites selected for direct observation/sampling ranged from localized areas of gas-rich sediment in a reduced state which were covered with bacterial *(Beggiatoa)* mats (both white and orange) to fields of fused hydrate mounds containing crude oil and inhabited by dense chemosynthetic communities of tube worms (*Lamellibranchia* sp.) and mussels (*Bathymodiolus* sp.). In areas where sea floor evidence of active seepage was most compelling, local mud flows, gas-related craters, fields of mussel shells, and distinct hardgrounds/buildups of authigenic carbonate were common features. These sites also correlated well with the strongest zones of surface to near-surface amplitude anomalies. The amplitude anomalies are thought to correspond to slow-velocity gas-charged sediments rather than fast-velocity authigenic carbonates which tend to form poor-reflecting, discontinuous boulder fields and irregular mounds. At sites with substantial surface evidence of hydrocarbon seepage, clear fault-related pathways for migration of fluids and gases to the surface were observed on the 3-D seismic data.

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