

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

Lawrence M. Cathles¹, Steven L. Losh² (1) Cornell University, Ithaca, NY (2) Cornell, Ithaca, NY

The Hybrid Petroleum System of the Onshore and Offshore Louisiana Gulf of Mexico Basin

The Gulf of Mexico basin contains Lower Cretaceous and older, pre-delta and shelf carbonate hydrocarbon source rock and also Tertiary deltaic shale source rock. Maturation of both attended the outward progradation of the shelf edge in Tertiary time. The petroleum system in this mixed-source delta is investigated through modeling and observations along a transect from the Arkansas-Louisiana border to the Sigsbee knolls. Present temperatures and vitrinite Ro maturities are well matched by a heat flow that followed rifting at 148 Ma and delta construction by sediments of normal radiogenicity on a lithosphere with low flexural rigidity. Hydrocarbon maturation of both sources proceeded as the shelf prograded seaward. A linear decrease in the oleanane index and other geochemical indicators from north to south across the offshore portion of the transect, where we have data from over 219 oils analyzed as part of a GRI-sponsored project, suggests a progressive offshore decrease in importance of Tertiary oil sources. Modeling shows the Tertiary sources are maturing today in southern Louisiana, and the Lower Cretaceous and older sources are maturing today past the shelf edge. This, together with the observation that oils in the offshore parts of the transect appear to have been gas washed in the deepest sand in the area when the sand was close to its present burial depth, suggests that reservoir filling was recent and could have promoted by recent gas migration. Hydrocarbons may be drawn to major accumulations such as the Jolliet/Bush Hill system in Green Canyon Block 184 from radial distances as great as ~40 km. This estimate is based on 3D maturation modeling and the current hydrate accumulation and gas venting rates at Bush Hill.