Tuesday, March 18, 2008

Petroleum Club • 800 Bell (downtown)
Social 11:30 a.m., Lunch 11:45 a.m.

Cost: $30 with advance reservations, $35 for walk-ins, space available ($15 for Emeritus and Honorary).

The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476 (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

by ***J. Kent Snow***
ENI Petroleum

The Great Pliocene Salt Squirt–Mechanics of Folding along the Down-dip Limit of Salt, Gulf of Mexico

From Perdido Canyon to Atwater Valley, the frontal fold-thrust belt along the down-dip limit of salt in the deepwater Gulf of Mexico has become a very active structural play. Salt has played an active role in forming these structures and influencing the deposition of reservoirs of Paleogene, Miocene and Pliocene age. A key to better predictive geologic models for successful hydrocarbon exploitation lies in understanding the mechanisms of salt involvement.

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Seismic interpretation across the frontal fold belt was used to sequentially reconstruct 14 horizons from the present through end of the Cretaceous. The top, base and pinchout of both shallow and deep allochthonous salt were well imaged. Paleobathymetry was reconstructed to seafloor gradients representative of present conditions. Cover shortening and deep-salt area, recorded for each time step, show salt flow into the frontal anticline exceeded shortening during Miocene folding. During Pliocene folding, expulsion of deep salt exceeded shortening. Similar effects are observed in other analogues.

The geometry of buckle folding above a mobile substrate requires that material initially moved into the fold core is expelled during continued shortening. This can be explained by two mechanically distinct drivers: 1) horizontal buckling of cover sediments forces salt into the fold core or 2) excess halostatic fluid pressure forces vertical flexures of the cover. Geodynamic models for a stiff isostatically-supported layer predict a large difference in flexural wavelength for vertical or horizontal loading.

The observed short-wavelength folds (~10 km) can be modeled as horizontal buckles that nucleated in early Paleogene time and were controlled by the elastic thickness of Cretaceous strata. The observed long-wavelength Miocene fold (~50 km) cannot be similarly modeled. However, a simple model of continuous plate flexure resulting from excess halostatic pressure effectively predicts the observed wavelength. The halostatic pressure model further predicts that deep salt will rise to an isostatically compensated elevation well above the regional datum when released through emergent salt diapirs. Reconstruction shows more than a kilometer increase in bathymetric relief associated with the emplacement of shallow salt. Extensive, nearly concordant contacts observed below shallow salt imply that an almost catastrophic release of excess halostatic pressure occurred in the Pliocene.

Biographic Sketch

J. Kent (Zeke) Snow received a BS in geological sciences from Cornell University in 1984 and a PhD in geology from Harvard University in 1990, followed by post-doctoral fellowships at Harvard and the California Institute of Technology, where he continued research on the geodynamics of extensional tectonics in the Basin and Range Province, southwestern United States. In 1995 Dr. Snow left academia to join Exxon Production Research Company. In 1998 he moved to Exxon Exploration Company, providing structural, tectonic and geodynamic analysis at regional, basin and prospect scales in the deepwater of West Africa and Brazil. From 2001 to 2006, he worked in Special Studies at Exxon Production Company focused on tight gas resources in the West Texas and North German Permian Basins. He is currently employed by ENI Petroleum working on the Gulf of Mexico and Alaska.