Paleocene-Eocene Drawdown and Refill of the Gulf of Mexico

Josh Rosenfeld[1]

[1]Independent Geologist

Abstract

Rosenfeld and Pindell (2002, 2003) hypothesized that Late Paleocene-Early Eocene docking of the northward mi-grating Caribbean Plate blocked the 200 km strait between the Florida/Bahamas Block and Yucatan, thereby isolating the Gulf of Mexico basin from the world ocean. Within several thousand years, net evaporation in the Gulf low-ered its level by about 2,000 meters forming a land bridge across the eastern Gulf that encompassed Yucatan, Flori-da, Cuba, and the Bahamas. The land bridge was enhanced by isostatic uplift of the basin's margins as sea level dropped. After 1 Ma of isolation, reconnection with the world ocean and energetic refill of the basin cut a deep thalweg between Florida and Cuba. This relatively short duration drawdown explains many phenomena unique to this period of Gulf history, including:

- the excavation of deep canyons across contemporary continental shelves and slopes: (*e.g*., Yoakum, St. Landry, Chicontepec, Bejuco-La Laja), many canyons of subaerial aspect cutting the lower continental slopes west of Florida and north of Yucatan, and sinkholes in present day water depth exceeding 1,000 m.

- the sudden deposition, and equally sudden cessation of a thick and widespread high net sand blanket in the deep Gulf Basin hundreds of kms beyond the contem-poraneous shelf edge;

- salt deposited in the Tertiary Veracruz Basin; and

- a regional unconformity in the carbonate-dominated eastern Gulf Basin.

The drawdown is coeval with, and may have triggered, the worldwide Paleocene-Eocene thermal maximum (PETM) through the release of voluminous methane from destabi-lized hydrates and breached conventional reservoirs as the water level dropped.
The drawdown profoundly affected the petroleum geology of the Gulf of Mexico by deposition of the Wilcox "Whopper Sand" reservoirs in U.S. and Mexican waters, and porosity enhancement by fresh water infiltration and leaching of Golden Lane Atoll and deep-water carbonates of the Poza Rica and Campeche Sound Trends.

Although general acceptance of the Paleocene-Eocene Gulf drawdown has met resistance, recently available ba-thymetry along the deep western Florida and northeastern Yucatan continental slopes provides convincing evidence in the form of sinkholes and steep-walled canyons. Moreo-ver, detailed study of the Chicontepec canyon leads to the conclusion that bathyal turbidite deposition weas inter-rupted by subaerial erosion and oil seepage.