Pimienta-Tamabra(!) Petroleum System Dynamics and Exploration Potential in Deep Water Areas, Southern Gulf of Mexico

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The Pimienta-Tamabra (!) giant petroleum system in the southern Gulf of Mexico extends from onshore and shallow-offshore areas out into deep water. This study examines this petroleum system's dynamics in order to evaluate exploration potential in deep water areas, using an integrated, quantitative, basin modeling approach.

One regional 2D section from this area was used to study various aspects of the petroleum system. The main constraints are subsurface temperature from within the Pimienta-Tamabra (!) petroleum system, observed maturation levels in the primary source rock, and known hydrocarbon accumulations.

Based on measured subsurface temperature variations, three thermal models (hot, median, cold) were considered equally valid. Our results indicate that the median model is the optimal case. With this model, Tithonian source rock became mature in early Eocene, reached peak oil generation in middle Eocene, and started generating thermal gas in middle to late Miocene. Twenty seven sensitivity cases were simulated to assess the migration history and potential for hydrocarbon accumulation within Paleogene sands that may be present in deep water areas. Variables included temperature, source rock quality, and hydrocarbon mobility.

All sensitivity cases produce hydrocarbon accumulations in the middle Cretaceous reservoirs in onshore areas. In deep water areas most of the sensitivity cases indicate that middle Paleogene sands would have been charged from the late Oligocene to the middle Miocene, when the reservoir temperature was in the range of 65°C to 80°C. Top Paleogene sands would have been charged during the middle Miocene to late Miocene, when the reservoir temperature was in the range of 47°C to 60°C.