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Mobile Shale Systems in Offshore Trinidad and Eastern Venezuela

Mobile shales are an important component of the overall history of evolution in the Columbus and Offshore Orinoco sub-basins of the eastern East Maturin Basin, offshore northeastern South America. The area sits on the southeastern front of the modern day Barbados Accretionary Prism. It is an area of active strike-slip tectonics, large-scale growth faulting and enormous sedimentation from the Orinoco Delta.

Detachment growth folding is a prominent feature in the shelf strata. Overpressuring in the shales is indicated on sonic and density logs, and reflected in seismic velocities. Mobile shale features include shale walls, welds and rollers. Mud volcanoes occur as mud wall complexes, pyramidal cones, "christmas tree" and "inverted christmas tree" structures and straw-like diapiric features. Gas hydrate is prevalent throughout deep water and has been sampled in drop core. It is especially prevalent in areas cut by strike-slip faulting, and is not limited to areas proximal to mud volcanoes.

The region hosts a worldclass Cretaceous-age source rock; the Naparima Hill/Gautier (3-13% TOC) and hydrocarbon generation plays a role in shale overpressuring. Thermogenic and biogenic hydrocarbons have been collected from seeps and mud volcanoes both onshore and offshore. Diagenetic release of clay-lattice locked waters, generation of hydrocarbons and active tectonics have all played a role in shale fluidization.

Deep shale diapirs appear to be initially mobilized by regional extension resulting in rise of diapiric walls and time-equivalent development of listric normal faults. Later strike-slip motions formed several NE-SW oriented anticlinal hydrocarbon trends. To the east, these right lateral strikeslip faults show seafloor expression and submarine mud volcanoes occur along their extent. Farther eastward strike-slip motions die out, mud volcanoes appear to be randomly distributed.