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Pliocene and Miocene Shoreface Gas Plays in the Macuspana Basin, Southeastern Mexico

Pliocene and Miocene shoreface deposits in the Macuspana Basin, southern Mexico, represent a major potential for additional development of gas resources in the structurally complex Macuspana Basin. In a joint study with PEMEX Exploración y Producción, the Bureau of Economic Geology conducted a regional stratigraphic and structural evaluation of the Pliocene and Miocene section in the Macuspana Basin, with the goal of delineating plays for potential development.

The primary trapping mechanism for Pliocene and Miocene gas reservoirs in the Macuspana Basin is structural, with many gas accumulations in three-way and four-way closures in growth-faulted areas that appear to be associated with basin-wide shale evacuation. A late stage of tectonic inversion in the southwest part of the basin introduced additional structural complexity. A 200- to 1000-m-thick lower Pliocene highstand shelf succession forms the regional top seal for these reservoirs. Stratigraphic architecture is also inferred to provide additional traps where Upper Miocene shoreface sandstones pinch out into low-permeability shelf mudstones.

Major play characteristics such as reservoir seal, source-rock maturity, depositional system, structural closure, hydrocarbon type, and migration pathways impact potential gas production in the Macuspana Basin. Hydrocarbons from Tithonian and Cretaceous sources dominate over contributions from Tertiary gas sources. Upper Miocene risk factors include northwestward pinch-out of shoreface sandstones and downdip pinch-out of mixed carbonate-clastic prograding complexes in the offshore basin. The main risk factor for Pliocene reservoirs is seal integrity.