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Numerical Modeling of the Thermal Maturation, Petroleum Generation and Migration in the Central Tucano Basin, Brazil

Basin modeling results of the central Tucano basin, including 1D and 2D models, are discussed in this paper.

The Tucano basin, located onshore northeast Brazil, is part of an aborted rift system, originated in the Neocomian, and consists of east and west dipping half-grabens. The sedimentary fill in the prerift stage is mainly of Jurassic age and includes the potential reservoir of the Sergi Fm. The synrift development (Berriasian-Aptian) began with the main potential source rock of Candeias Fm, and was followed by a thick sandstone succession of the Ilhas and Massacara Groups.

Two regional seismic lines and four wells were modeled. Calibration was achieved considering eroded thickness from the upper to middle synrift succession that increases towards the western border.

The models indicate that generation and expulsion could have occurred in the depocenters. Petroleum saturation and migration was mainly restricted to the depocenter. Uncertainties are related to the presence of effective source rocks. The principal pulse of petroleum generation-expulsion for the Candeias Fm could occur during Barremian-Aptian times, coeval with sedimentation of the Massacara Group.

Model results indicate that the migration of fluids was influenced by faulting. Compartmentalization is present, especially with an impervious fault model. Vertical leakage is highly effective with pervious faults. Sergi Fm could represent an effective carrier bed in some regions. Petroleum accumulations appear mainly restricted to traps associated to, or near the depocenter.