Petroleum System Technology Applied to the Evaluation of the Oil and Gas Potential of the Brazilian Supergiant Southeastern Pre-salt Province: How Big Is It?

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Petroleum system modeling makes a major impact on exploration strategy when new elements or their combinations are well documented. Supergiant petroleum provinces typically have multiple source rocks, reservoirs and seals. Defining these elements and establishing their contributions, especially to mixed petroleum systems in the same geologic realm, can be a challenge. In frontiers and mature basins, retrenching with geological, geochemical and geophysical data may be insufficient to achieve the understanding of the petroleum systems to the necessary levels to make a major impact on oil and gas exploration. A completely new insight of oil and gas provenance and potential in the prolific basins of Santos, Campos and Espírito Santo, in Southeastern Brazil has allowed the establishment of new concepts in oil and gas exploration in these areas. This was possible due to the application of a petroleum system approach using the PetroMod 3D basin modeling to integrate a 3D PSDM seismic data and interpretation. Together with a high resolution geochemical technology, the approach was applied to evaluate gas and oils from the pre-salt sequence for thermal evolution calibration, cracking of oil to gas, oil mixing and oil quality predictions. The modeling results were also integrated with high resolution oil slick satellite technology and piston core samples taken over the supergiant Tupi oil province.