New Insights into the Petroleum Systems of the Solimoes Basin: Checking Petroleum Occurrences with 3-D Modeling Results

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Solimoes Basin is an intracratonic Paleozoic basin located in the northern Brazil. Although only 251 wells were drilled in such a large basin, of which ~155 are exploratory, it ranks among the top oil producing basins in Brazil. It holds large amounts of light oil (42 to 52o API) and gas and Jandiatuba-Juruá (!) is the main petroleum system, responsible for the commercial accumulations in the basin.

The main reservoir is the fluvial-aeolian sandstone of the Jurua Fm that is sealed by evaporitic rocks of the Carauari Fm. The classical trapping mechanisms are reverse faults combined with anticline folds of Jurassic-Cretaceous age. Burial of the source rocks to maximum 3800 meters (present day depths), together with a sedimentary section that was eroded, played the most important role in the hydrocarbon generation.

Concomitant and after the tectonic event above mentioned, the Paleozoic sequences were intruded by several widespread and thick igneous rocks that contributed for hydrocarbon generation and were responsible for secondary cracking of the oil accumulations.

The source rock consists of the Devonian black shales of the Jandiatuba Fm (TOC ~5.5%). Several inconsistencies were detected between the locations of the petroleum occurrences and the interpreted main source rock pods. New 3D modeling results indicate that additional source rock intervals must exist deeper in the basin in order to explain the occurrence and composition of petroleum detected in wells.

A new set of maps was generated using public (ANP) seismic and well data, as well as proprietary gravity, magnetic and gradiometry data. The distribution of liquid and vapor petroleum in the basin is not explained yet by known occurrences of source rocks. The new 3D modeling results are meant to improve the current knowledge of the petroleum systems of the Solimoes Basin.