

The Giant to Super Giant Sub-Salt Onshore Hydrocarbon Province of the Solimões Basin, in the Amazon Jungle, Brazil: How Big Is It?

Mello, Marcio R.¹; Azambuja Filho, Nilo C.¹; Catto, Antonio J.¹; Bender, Andre A.¹; Araújo, Mauro B.¹; Eiras, Jaime F.²; Lima, Charles C.² (1) HRT & Petroleum, Rio de Janeiro, Brazil. (2) STR Energia, São Paulo, Brazil.

With the discovery of Urucu oil & gas field, in Carboniferous pre-salt sequences of the Solimões Basin, in 1986, the oil exploration onshore Brazil has changed completely. At final, the opposition against the existence of a super giant hydrocarbon province beneath the Carboniferous salt sequence in the Solimões Basin has been broken. Today, after 22 years of production of more than 193 million barrels of 42 API oil, with only 76 wells, recoverable reserves are mentioned to be in the order of more than 248 million barrels of light oil. Recently, the discovery of other oil & gas fields in the same pre-salt province, suggests that the Solimões reserves indeed can be much larger, getting numbers close to 1 Billion bbls of oil equivalent. The accumulations of light oil and condensates (API ranging from 41-45) are trapped below a salt layer that acted as the BEST preservation seal element possible.

This paper comprises a quantitative 3D petroleum system study used to assess the interplay among source, reservoirs, sealing rocks and trap geometries. As a result of the assessment we obtained insights of the variability of the thermal evolution of the source rocks, hydrocarbon types, charge, timing of migration, accumulation and preservation and oil quality, and a volumetric estimate of the oil and gas potentially accumulated in the main reservoir. The study was based on detailed geological, geochemical and geophysical information provided by HRT & Petroleum and STR Energia. The simulation of the role of the diabase intrusions in the maturation and oil & gas migration and accumulation was a key factor in the evaluation of the hydrocarbon potential of the basin.

The main results indicate the presence of an overcharged marine Devonian source rock system reaching full transformation into petroleum in the main depocenters where the igneous sills are close to the source rocks. Also, relatively normal hydrostatic pressure and temperature values occur, below salt, in the main eolian sandstone reservoirs from the Juruá Formation in the deepest part of the Basin.

The occurrence of an ideal conjunction of the elements and processes of this petroleum system allowed the establishment of the most prolific Paleozoic oil and gas province in Brazil.