ADDITIONAL EXPLORATION OPPORTUNITIES FOR THE PRE-SALT LIMESTONE/SILICEOUS PLAYS IN THE CAMPOS AND SANTOS BASINS, OFFSHORE BRAZIL

Kattah, S.S.
PGS

ABSTRACT:

The discovery of the Lula field in 2006 opened a new E&P frontier in Brazil. Several multi-billion-barrels, light-oil discoveries have recently been made in the limestone of the pre-salt succession of the Campos and Santos basins. 10 billion or more barrels of oil are expected to be added to the Brazilian reserves by 2022 after appraisal and confirmation of these recent discoveries (from ANP, 2014). As demonstrated by the results of this study, other Brazilian pre-salt limestone areas remain unexplored or under-explored and available for future licensing.

This study considers the exploration potential of the BMS-50/52 and BS-1_South 3D seismic surveys areas within the Santos Basin (on the trends of Carcará and Sagitário discoveries) and of the BC-200 merged-survey in the deepwaters of the Campos Basin (on the trend of Pão-de-Açucar/Seat/Gávea and Wahoo discoveries). Several large opportunities have been identified based on preliminary seismic interpretations of 3D Multi-Client PSDM surveys.

The BMS-50/52 and BS-1_South 3D surveys are within the pre-salt play polygon of the Santos Basin. The pre-salt exploration trends identified in the these surveys are: a) Rift/Pre-rift play in the central-west, with hydrocarbon accumulations in siliciclastic reservoirs of the Paleozoic (pre-rift) to the Lower Cretaceous rift succession in fault traps; b) Sag/Rift Limestone Edge Play (Sagitário trend), comprising structural or paleo-topographic traps beneath the base salt in microbial platform limestone, with occasional isolated microbial buildups; c) The Carcará North/Itaipava Sag-Rift Limestone Play which is a light-oil trend that includes the Carcará discovery in BMS-8, with hundreds of square kilometers of closures at the base salt and relief reaching 350 to 400 meters. In this trend, reservoir facies are expected to have excellent reservoir properties and are interpreted as very large microbial buildups, oriented along fault zones which are located at the edges of the previous rift horsts.

3D seismic interpretation of the pre-salt section in the deep to ultra-deepwater area in the Campos Basin has allowed the delineation of several pre-salt plays: i) Structural Play in coquinas (Late Rift to Sag); ii) Stratigraphic/Combination Play in coquinas (Late Rift to Sag); iii) Microbial Build-up Play on rift shoulders (Sag microbialites) and; iv) Microbial Build-up Play on volcanic complexes, potentially large limestone units beneath the salt nucleated on top of large volcanic complexes in distal settings. The hydrocarbons were generated mainly by same source-rock interval (the lacustrine Lagoa Feia Formation) that has sourced most of the discovered fields in the Campos Basin. Coquinas and potential limestone/siliceous microbial facies, similar to the ones in the Santos Basin and African counterpart discoveries, are the reservoir targets as indicated by the seismic facies and observed geometries. A thick evaporitic succession provides the main sealing unit for the potential accumulations. The structural play offers low exploration risk scenarios, while potential build-up's over the tops of volcanic complexes have high risk due to reservoir presence/quality and migration. However, this last play could provide the largest exploration rewards as some of these positive features that lie just beneath the salt have hundreds of square kilometers of closure, offering potential for multi-billion barrels of hydrocarbon discoveries.

PALAVRAS-CHAVE: PRE-SALT LIMESTONES, SILICILYTES, COQUINAS, MICROBIAL BUILD-UP'S, MICROBIAL COMPLEXES