Unraveling the Paleozoic “Basement” Structure and Its Impact on the Petroleum System in the Western Gulf of Cadiz (Southwest Iberia)

Hugo Matias[1], Joao Carvalho[4], Paulo Menezes[3], Luis Matias[2], Fernando Santos[2] and Valeria Barbosa[5]

[1.]Exploration, Repsol Sinopec Brazil, Rio De Janeiro, Brazil.

[2.]CGUL, Lisbon, Portugal.

[3.]UERJ, Rio De Janeiro, Brazil.

[4.]LNEG, Lisbon, Portugal.

[5.]MCT-Observatorio Nacional, Rio De Janeiro, Brazil.

September 16, 2014 Tuesday 2:15 P.M. International Conference & Exhibition, Istanbul, Turkey

Abstract

Recent developments in hydrocarbon exploration offshore Portugal, in particular in the offshore Algarve basin, have increased the interest in basement structure studies in this area. Basement morphology plays an important role in salt tectonics, basin development and thin-skinned mechanisms of rifting and tectonic inversion. Furthermore, geochemical data suggest the presence of a rich Paleozoic source rock that might be producing Meso-Cenozoic gas accumulations. Consequently, it is of paramount importance to comprehend the relief of the Paleozoic “basement” for predicting the Meso-Cenozoic depositional history and patterns as well as to understand the petroleum system of the area. However, the deformation suffered by the basin coupled with halokinetic processes and the scarcity of coverage and poor resolution of available seismic data makes it difficult to map the Paleozoic “basement” accurately. To address the aforementioned problem, an integrated geophysical interpretation was performed. The interpreted dataset comprised 58 lines of 2D seismic reflection data. The seismic interpretation was guided by 2D forward and 3D inversion gravity modelling and regional magnetic interpretation. Geochemical data collected from onshore outcrops, and offshore wells were later used as an input for 2D basin modelling studies to address source rock potential of the Paleozoic sediments. The Algarve Basin is delimited to the south by a series of basement highs with a NE-SW orientation (Guadalquivir Bank) and to the West by the Sao Vicente and Sagres Highs. The basin strikes around ENE-WSW direction and is bisected by NW-SE faults in three sub-basins (NE, Central and SW sub-basins). The Central basin, where the main depocenter strikes E-W, has a maximum depth of approximately 10 km and Meso-Cenozoic thicknesses of 9,000m. Some terraces associated with horsts and grabens were correlated with regional faults that extend onshore. Geochemical data from Paleozoic sediments shows that average TOC data TOC of 1.5% and type III kerogen. The 2D basin modelling concludes that despite de fact that the Paleozoic rocks could be presently overmature, they could have generated significant amounts of gas in earlier stages of basin development that afterwards migrated through salt windows to shallower Meso-Cenozoic reservoirs.

AAPG Datapages/Search and Discovery Article #90194 © 2014 International Conference & Exhibition, Istanbul, Turkey, September 14-17, 2014