

2-D Petroleum System Modeling in the Deep Water of the Foz do Amazonas Basin, Brazilian Equatorial Margin

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Abstract

The Foz do Amazonas Basin, situated on the northernmost part of the Brazilian Equatorial Margin has a complex evolution that links it to the Equatorial Atlantic Ocean opening. After three different rift stages, where the third of them is characterized by a marine deposition in an epicontinental sea setting, the break up took place in the Upper Albian and after this, a transgressive sequence started its deposition, which lasted until the Cenomanian. Exploration efforts began in the seventies and eighties in shallow water with the discovery of the Pirapema Gas Field in sandstones which was deposited during Neogene interval. In the nineties, these exploration efforts were moved to deep water due to the 3D seismic higher resolution that allowed the identification of potential hydrocarbon source rocks and turbidite reservoirs. Between 2001 and 2004, only three wells were drilled in deep water in the area of the Amazon Cone aiming shales and sandstones interbedded at the upper section of the Cenozoic. There are two potential source rocks previously known in this basin: lacustrine with marine influence, from Aptian age, and marine, from Albian to Turonian, both drilled by wells located in the platform area. For this study, these source rocks were identified and characterized by analysing and interpreting the total organic carbon (TOC), the vitrinite and the Rock-Eval pyrolysis data. The integration between the organic geochemistry and the 2D petroleum system modeling held in the Foz do Amazonas Basin, were aimed to provide a better understanding of the petroleum system dynamics, allowing the evaluation of the hydrocarbon potential and further, reducing the exploration risks. The modeling was performed using structured mesh

forward basin modeling tool (TemisFlow™) in a deep water section, permitting a better prediction of generation, expulsion, migration and accumulation's timing of the oil. The results suggest that marine source rocks, in terms of maturation, are currently in the main oil window and has reached the pick of expulsion during Middle Miocene concomitant with the Amazon Cone development. These rocks are the main generator for the Upper Cretaceous reservoirs in this basin.