2-D seismic mapping of the Santos Basin pre-salt interval with emphasis on the economic basement

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Abstract

The Santos Basin, located on the southeast margin of Brazil, is the offshore sedimentary basin with the highest oil production in the country, mainly in the Pre-Salt interval. The reservoirs found in this basin are composed of lithologically distinct carbonates (Itapema and Barra Velha formations), deposited in rift lacustrine systems developed during the breakup of the Gondwana paleocontinent in the Lower Cretaceous. This work is part of the Pre-Salt II Project of the Sedimentary Geology Laboratory of UFRJ (LAGESED) and was born from the need to analyze the basin from a regional perspective. To better understand the geology of the reservoirs it is necessary to use indirect imaging techniques of sedimentary and tectonic structures. Among these techniques, 2-D seismic imaging works very well for imaging large structures, offering a very complete regional coverage, and is indicated for this work. The visualization of the subsurface through 2-D seismic, associated with data from wells, magnetometry and gravimetry, generates sufficient information for the identification and subsequent interpretation of regional geological structures and possible areas of exploration. Thus, the objective of this work was the interpretation of the main features of the Santos Basin basement, such as the Outer High, the São Paulo Plateau, the Abimael rift and the Santos Cretaceous Hinge Line, with the exploratory character of finding new areas for hydrocarbon exploration. For this, 2-D seismic lines and data from strategically chosen wells were initially acquired from the National Petroleum Agency (ANP). Then, after receiving these, the work methodology was: (1) a bibliographic review of the Santos Basin; (2) importing the data into Petrel® software to make the quality control of the received material and necessary corrections; (3) identifying the main stratigraphic formations; (4) seismic interpretation of faults and horizons, besides the identification of regional structures with the support of the well data and also magnetometry and gravimetry data; (5) elaboration of regional maps of the main interpreted surfaces. This work proposed the generation of a regional map of the Camboriú Formation, the economic basement of Santos Basin. This, associated to the interpreted seismic sections and the gravimetric and magnetometric data, allowed the identification of four outstanding sub-regions in the basin: the Outer High and three structural lows, the Abimael rift and two depocenters in the NW and NE portions of the map. The latter stands out for presenting important characteristics for the existence of an oil system of interest, such as the existence of a good seal formed by continuous salt and also the proximity to the boundary between continental and oceanic crust, a region where the geothermal degree is usually higher, favoring gas generation. Thus, considering the importance of the studies on the Santos Basin at various scales, this work seeks to add new knowledge to what is produced by the Pre-Salt II Project.