ACOUSTIC INVERSION FEASIBILITY FOR RESERVOIR CHARACTERIZATION IN CEARÁ BASIN

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ABSTRACT: The economic environment of recent years, characterized by low price of petroleum barrel, brought again the importance of production in mature fields that are responsible for about 70% of worldwide hydrocarbon production. These reservoirs still have some significant volume of remaining oil in place that needs to be drained optimally, with new wells drilled in the best locations. Reservoir characterization studies are essential to try identifying these regions with hydrocarbon as they allow a good understanding of the field. Acoustic inversion can help to identify and quantify areas in the reservoir favorable for oil accumulation through well data analysis (porosity and impedance, mainly) and seismic data analysis (amplitudes of 2D seismic lines or 3D seismic cubes). Thus, the main objective of this work is to evaluate the feasibility of seismic inversion studies in reservoirs from Ceará Basin. For this purpose, we used well and seismic data set from Ceará Basin, covering the four main fields in production (Xaréu, Curimã, Atum and Espada) and a new exploration frontier in deep water. The whole data set was provided by ANP (National Petroleum Agency). The methodology used here is based on where the reservoir has a good correlation between the properties porosity and impedance, at the end of the seismic characterization process, it is possible to obtain maps or cubes of porosity that can be integrated in the geological and geostatistical modeling, building a model more realistic and reliable. Seismic amplitudes represent the impedance contrasts between the different layers. However, for reservoir characterization, it is necessary to have the properties of the layers and not properties on the interfaces. Seismic inversion process converts the interface property (amplitude) into a layer property (impedance). In general, the wells from Ceará Basin have a good correlation between porosity (NPHI) and acoustic impedance (AI), around 80-90% (some wells with 98-99% of correlation). Furthermore, it is possible to observe clearly the facies behavior: non-reservoir facies have low porosities and high impedance; reservoir facies have high porosities and low impedances. These initial results suggest that a reservoir characterization study using acoustic seismic inversion could generate properties (porosity maps or cubes, for instance) to build a more consistent reservoir model for Ceará Basin area.

KEYWORDS: RESERVOIR MODELING, PETROPHYSICAL PROPERTIES, INTEGRATED STUDIES.