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DETERMINATION OF THE DISTRIBUTION OF LOWER MIOCENE RESERVOIR IN WHITE TIGER OIL FIELD BASED ON THE RESULTS OF SEISMIC ATTRIBUTE ANALYSIS

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Abstract

In this study, we concentrated on re-evaluating the Lower Miocene reservoirs, particularly layers 23, 24, 25, 26, and 27, with a specific focus on the Northern and Central regions. The targeted product layers are delimited by two seismic reflection surfaces, SH-5 and SH-7, within the Miocene sediments of the White Tiger oil field. By employing two key attributes – sum positive amplitude (SPA) and root mean square (RMS) - we successfully identified areas exhibiting high-amplitude anomalies associated with oil-bearing rocks. These findings allowed us to construct a comprehensive map highlighting the location and distribution of potential oil and gas reservoir layers within the study area

1. Introduction
2. Database and methodology
3. Results and discussion
4. Conclusion

1. Introduction

The White Tiger oil field is strategically located on the southern continental shelf of Vietnam, approximately 120 km southeast of Vung Tau, adjacent to the technical and production base of the Vietnam-Russia Joint Venture (LDVN) "VietsovPetro" The study area is the central part of the Cuu Long basin (Figure 1). Oil has been mainly produced from fracture basement, Oligocene and Lower Miocene sandstones

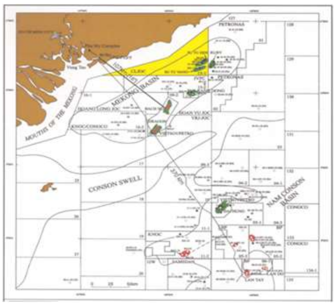

Figure 1. Location map of Bach Ho oilfield (under VietsovPetro)

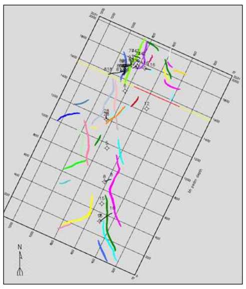

Figure 2. 3D PSDM seismic study area

2. Database and Methodology

The seismic data used for this study is a 400 km^2 PSTM 3D seismic cube.

Unsupervised Neural Network (UNN) and UNN constantly associated with PCA to predict distribution of reservoirs (fig. 2).

The principal component analysis (PCA) method was used.

3. Results and discussion

After conducting numerous tests on various seismic attributes to determine the relative distribution of sands within the reservoirs, two attributes were selected for further analysis: the sum of positive amplitude (SPA) and the root mean squared (RMS)

Figure 4a illustrates that the anomalies of SPA in reservoir 23 are widely distributed in the northern and central parts, indicating coastal sand and sand bars. However, in the southern part, the anomalies appear mainly in a lenticular form, corresponding to a freshwater lake environment. This observation aligns with the depositional environment and reservoir characteristic, thin sandstone interbeded thick shale, of well 1203 (Figure 3). Reservoirs 24 to 27, shown in Figure 4b, have a more limited distribution, primarily concentrated in the higher regions of the field in the northern and central areas. Additionally, a few SPA anomalies are observed in the eastern part of the field. Nonetheless, when combined with the RMS attributes, only a few small channels are evident in reservoirs 24 to 27, and these channels do not appear in reservoir 23 (Figure 5a, b).

Hence, the SPA attribute proves valuable in identifying the distribution of sand bodies within the Lower Miocene formation, while the RMS anomalies area shows promise for potential good reservoirs.

In the case of reservoir 23, sand bodies are predominantly located in the higher elevations of the field, exhibiting a broader horizontal distribution in the northern region and gradually narrowing towards the south. As for reservoirs 24 to 27, they are mostly distributed around wells 15 and appear as channels along the faults extending from the eastern part of the northern region to the central area. It's worth noting that the seismic data quality in the upper section, being the target for seismic PSDM processing, is not ideal for utilizing seismic attributes.

Comparing the distribution of reservoirs (Figure 6) with the anomalies of the aforementioned seismic attributes, we observe a considerable compatibility between the attributes and reservoirs 23 and 24. Therefore, in this research, the seismic attributes of reservoirs 23 and 24 are solely utilized for constructing the 3D models of the Lower Miocene reservoirs.

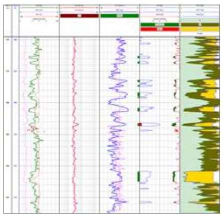

Figure 3. Log respond in 23 reservoir, BH-1203 well

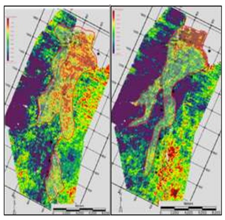

Figure 4. Seismic attribute SPA a:SH-5, SH-6; b: SH-6 , SH-7

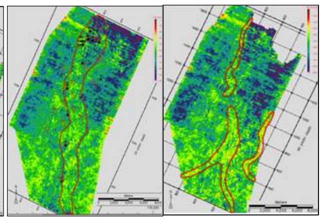

Figure 5. Seismic attribute RMS: a :SH-5,SH-6; b: SH-6, SH-7

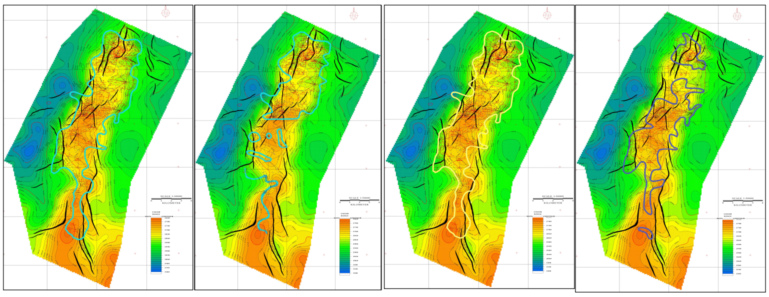

Figure 6. The distribution of reservoirs 23-2 (a), 23-4 (b) 24 (a) and 25 (b)

4.Conclusion

Seismic attributes are of paramount importance in seismic analysis, forming a foundational element for assessing the hydrocarbon potential of the subject under study. The process involves carefully selecting optimized attributes that can effectively identify various environmental characteristics, including gas and liquid accumulations, lithological features, porosity, the presence of channel incisions, diverse types of coral reefs, ambiguous lithological boundaries, and stratigraphic variations.

In the case of the Bach Ho field, the careful selection of two attributes, Sum Positive Amplitude (SPA) and Root Mean Square (RMS), has proven instrumental in delineating potential reservoir layers within the lower Miocene formation. These attributes have greatly contributed to the evaluation of the field's hydrocarbon potential, enhancing our understanding of its subsurface geology.