

SEISMIC FACIES ANALYSIS OF BLOCK X, CUU LONG BASIN, VIETNAM

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Abstract

Block X located near oil and gas fields with large commercial reserves in Vietnam. Up to now, the mainly exploration objects are Late Oligocene and Early Miocene. This paper shows seismic facie analysis and comments on the potential for finding oil and gas traps in the study area. Two seismic sequences were recognized in the block X, which are the main exploration objects of study area. Five seismic facies were identified in the study area, incorporated with five seismic reflection attributes which were used to classify the facie types (reflection amplitude, reflection continuity, dominant frequency, external form and internal configuration).

Introduction

Seismic facies are mappable, three dimensional seismic units, consisting of groups of reflections in which parameters differ from those adjacent facies units. Seismic facies analysis is the interpretation of seismic reflection parameters, such as amplitude, configuration, continuity, and frequency within the stratigraphic framework of a depositional sequence. Seismic reflection pattern geometries can reflect the deposition process, provenance direction and geological background of sediments. Block X is located in the Cuu Long basin, 140 km southeast of Vung Tau city, next to many oil and gas fields with commercial reserves in Vietnam (Fig. 1). According to regional studies, the main exploration objects in block X are Upper Oligocene (sequence C) and Lower Miocene (sequence BI.1). The pre-Tertiary fractured basement is not considered an exploration object because the basement surface is too deep. Up to now, block X has only had exploration well D1, drilled in 2015 into the lower Miocene sediments and not yet drilled into the Oligocene. This study uses 3D seismic dataset that covering approximately 250 km² located at the Cuulong basin, offshore southern Vietnam and focuses on the main exploration objects in block X (Upper Oligocene (sequence C) and Lower Miocene (sequence BI.1)).

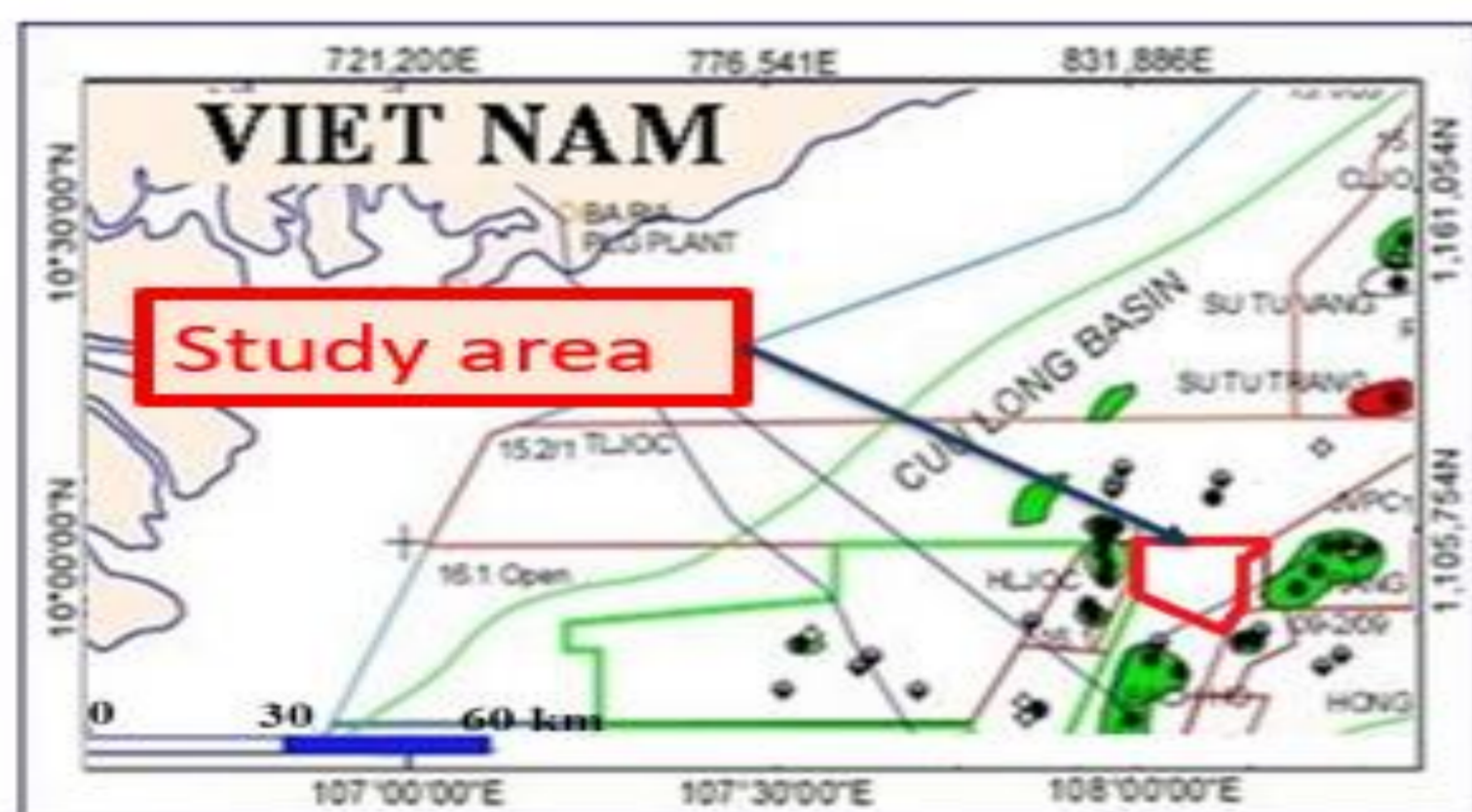


Figure 1. Location of study area

Seismic facies analysis of Late Oligocene and Early Miocene formation of block X, Cuulong basin

Three sequence boundaries have been recognized from the analyzed of several inlines and crosslines from 2-D seismic section: The top_BI.1 corresponds to the top of Lower Miocene, the top of upper Oligocene corresponds to the Top_C and the Top_D corresponds to the bottom of the upper Oligocene in the study area. (Fig. 2).

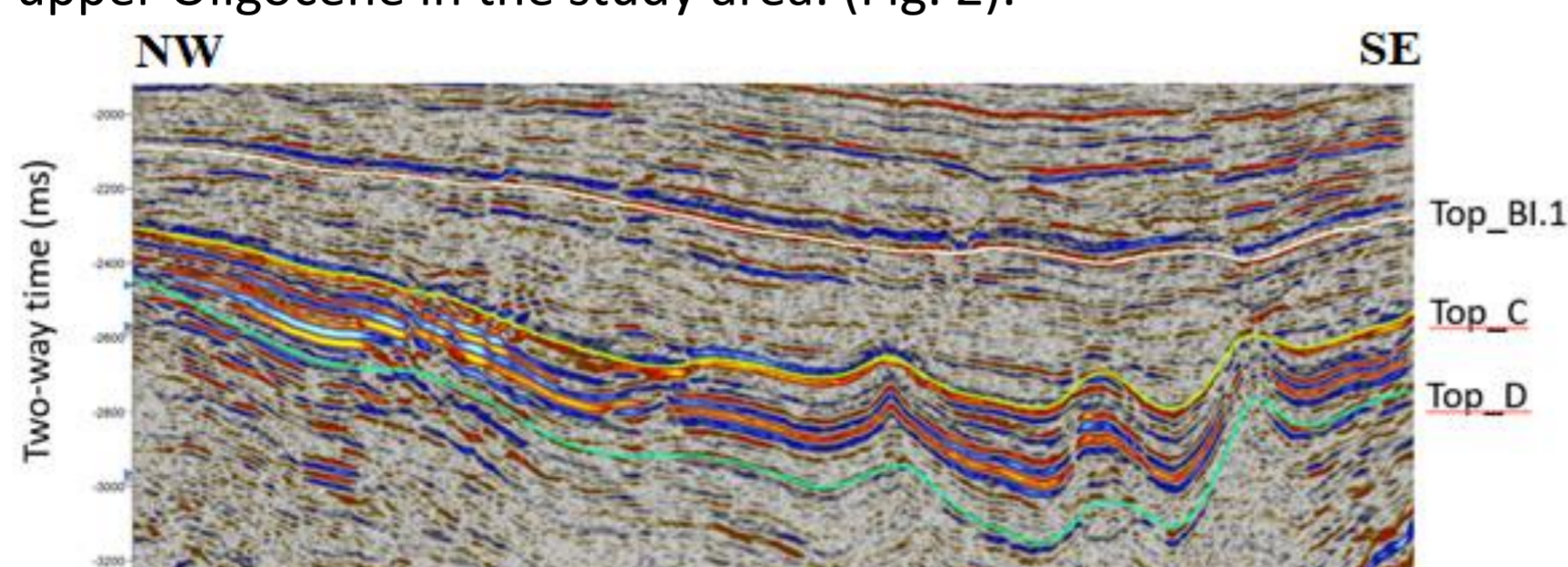
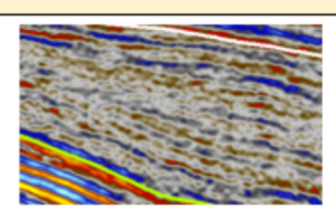
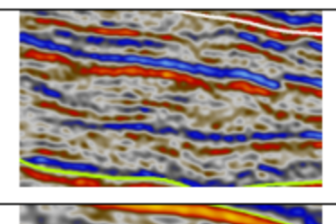
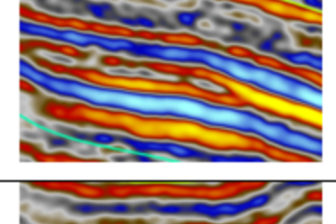
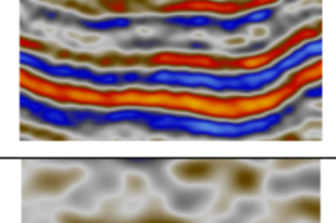
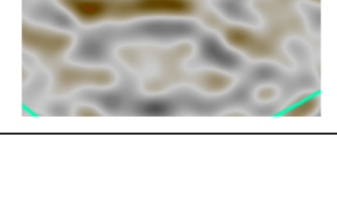


Figure 2. Identification of 3 seismic boundaries Top_BI.1, Top_C and Top_D on the seismic section

Through analysis of seismic sections in the study area, 5 main seismic facies have been divided (Table 1) using 5 criteria of seismic reflection characteristics: reflection amplitude, reflection continuity, dominant frequency, external form and internal configuration. Figure 3 shows the results of seismic facies analysis according to typical section of the study area with 5 identified seismic facies.

Table 1. Seismic facies classification table in the study area

Seismic section	Facie	Index Color	Criteria
	SF - 1	Green	1 - reflection amplitude, 2 - reflection continuity, 3 - dominant frequency, 4 - internal configuration, 5 - external form 1. Variable amplitude 2. Low - medium continuity 3. Medium frequency 4. Oblique 5. Thin sheet reflectors
	SF - 2	Pink	1. Average amplitude 2. Average continuity 3. Medium frequency 4. Parallel 5. Wedge shape
	SF - 3	Yellow	1. Medium - high amplitude 2. Average continuity 3. Medium - high frequency 4. Sigmoid 5. Wedge shape
	SF - 4	Blue	1. Medium - high amplitude 2. Medium - high continuity 3. Medium - high frequency 4. Parallel 5. Wedge shape
	SF - 5	Red	1. Average amplitude 2. Weak continuity 3. Medium frequency 4. Chaotic 5. Mound shape

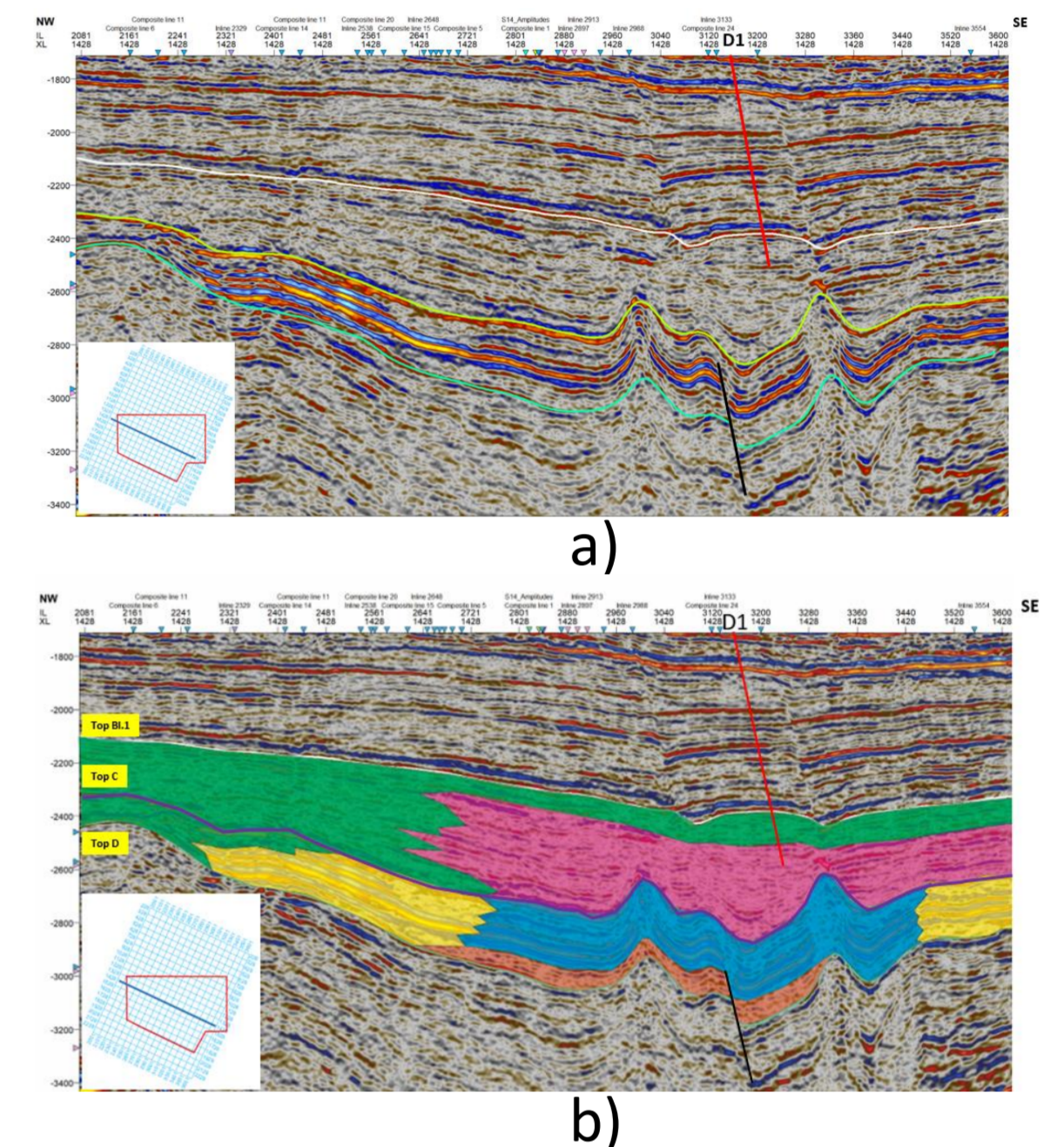


Figure 3. Identification of seismic facies on seismic section XL_1428 passing through well D1: a) uninterpreted section; b) interpreted section

By linking the identified seismic facies line by line, the authors have built seismic facies distribution map for the upper Oligocene and lower Miocene formations of study area (Figure 4).

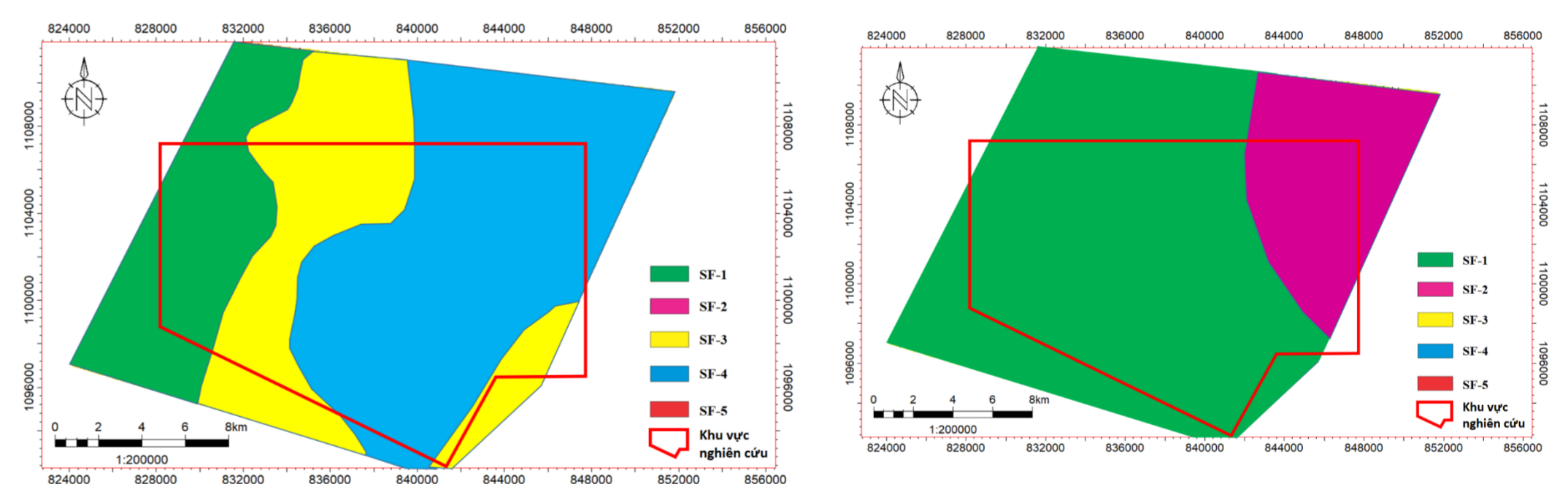


Figure 4. Seismic facies distribution map for the upper Oligocene (a) and lower Miocene (b) formations of Block X, Cuulong basin

Conclusion

Three sequence boundaries are recorded and 5 seismic facies have been determined for the upper Oligocene and lower Miocene formations, which are the main exploration objects of study area. Among them, seismic facies that may be related to potential oil and gas traps are: Facie SF-1: related to lakeshore sediments, may be good reservoirs for oil and gas; Facie SF-3: related to sigmoid-shaped wedges that could be potential stratigraphic traps; Facie SF-5: related to basin floor fan sediments that can form stratigraphic traps.

Reference

- Futalan, K., Mitchell, A., Amos, K., and Backe, G., 2012. Seismic Facies Analysis and Structural Interpretation of the Sandakan Sub-basin, Sulu Sea, Philippines. Search and Discovery Article.
- Mitchum et al., 1977a. Seismic stratigraphy and global changes of sea level, part 6: stratigraphic interpretation of seismic reflection patterns in depositional sequences AAPG Mem., 26 (1977), pp. 117-135
- Mitchum et al., 1977b. Stratigraphy and global changes of sea level, part 2: the depositional sequence as a basic unit for stratigraphic analysis AAPG Mem., 26 (1977), pp. 53-63
- Ramsayer, G. R., 1979. Seismic Stratigraphy, a Fundamental Exploration Tool. 11th Annual Offshore Technology Conference Proceedings, p. 101-109.
- Snedden, J. W., Sarg, J. F., and Xudong Ying, 2002. Exploration play analysis from a sequence stratigraphic perspective: GCS-SEPM Foundation Research Conference Proceedings, 79-97.
- Xu, G., & Haq, B. U. (2022). Seismic facies analysis: Past, present and future. Earth-Science Reviews, 224, 103876.