PS New Exploration Potential of Miocene-Cretaceous Buried Anticline Trap in the Greater Caucasus Fold-and-Thrust Belt, Azerbaijan

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Abstract

This study introduces a new tectonostratigraphic framework for the fold and thrust belt zone in the northeastern continuation of the Greater Caucasus, located in Azerbaijan. The petroleum system in this region has demonstrated effective functioning; however, hydrocarbon preservation remains a significant concern.

Historically drilling campaign was predominantly focused on structural highs exposed to the surface, particularly in the northern part of Azerbaijan. As a result, perspectivity of buried anticline traps has largely remained unexplored due to shortage of a good quality seismic data along Greater Caucasian belt.

Based on detailed geological analysis, including development of a chronostratigraphic chart and regional seismic cross-sections, we identified both thick-skin and thin-skin tectonic events, as well as the boundary between these structures on a regional scale. Our findings suggest opportunities for significant amount of resources in Miocene and Cretaceous formations. Specifically, the Diatom (Upper Miocene) and Chokrak (Middle Miocene) formations, deposited in a syn-compressional setting, pinched out toward the crest of structures, indicating that drilling along the flanks of these features could enhance exploration success.

Furthermore, the Cretaceous section is divided into Upper and Lower formations. The Upper Cretaceous are characterized by regional unconformity surfaces, while the Lower Cretaceous features deep marine turbidite systems that offer promising exploration targets.

This study emphasizes the need to focus exploration efforts on buried anticline traps, which are better preserved and less susceptible to erosion and biodegradation. Drilling along the flanks of structures, particularly for targeting Miocene reservoirs, could increase the chances of success. To fully unlock the potential of these opportunities, acquisition of high-quality 3D seismic data is critical. It will enable to effectively explore these deeper, more promising potentially hydrocarbon bearing traps.

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SOCAR Exploration

Introduction

This study introduces a new tectonostratigraphic framework for the fold and thrust belt zone in the northeastern continuation of the Greater Caucasus, located in Azerbaijan. Although the petroleum system is effective, hydrocarbon preservation remains a challenge. Past exploration mainly targeted surface structural highs, while buried anticline traps have been underexplored due to limited seismic data.

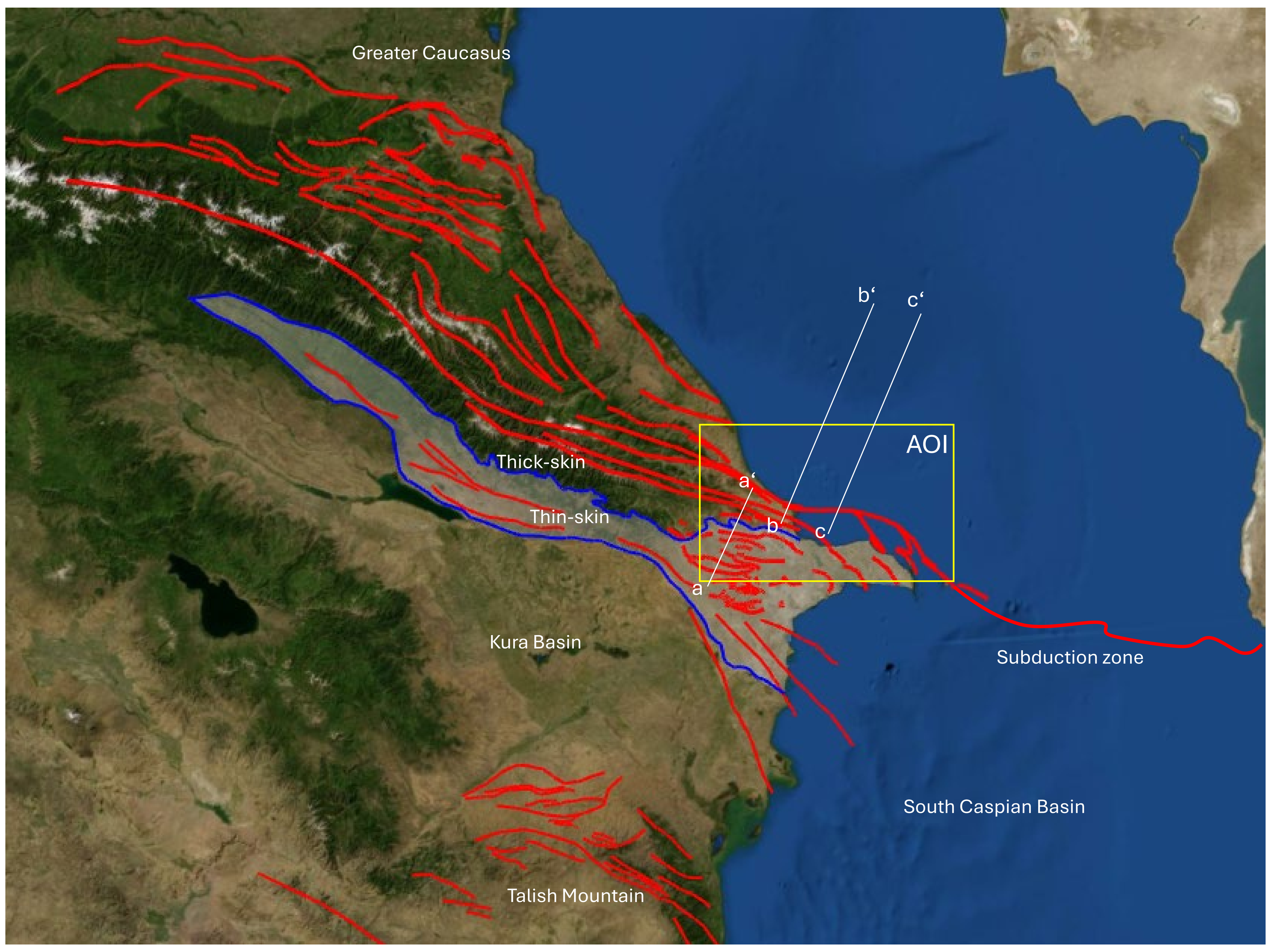

Fig. 1 –Surface exposure delineation based on satellite imagery

Methodology

Chronostratigraphic chart (onshore data) defined the regional framework. Balanced cross-section (mass balance method) ensured structural validity and shortening estimation.

Offshore seismic data supported structural and tectonic interpretation Thin- and thick-skinned zones identified by deformation style.

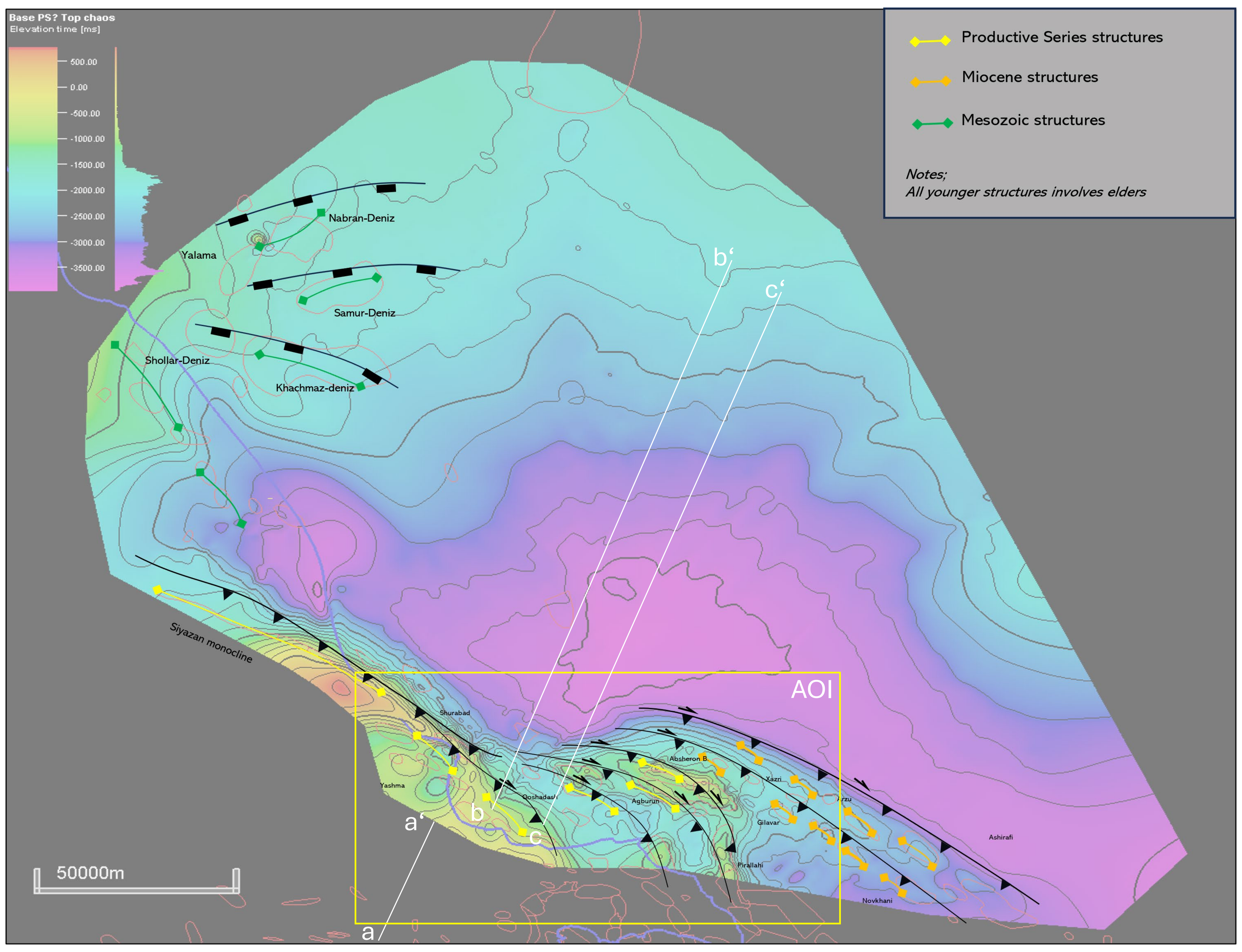

Fig. 2 – The surface map of the top Pliocene shows representative structural timing across the area

Result

Our findings suggest opportunities for resource potential in Miocene and Cretaceous formations within buried traps, which are better preserved. The Miocene formation, deposited in a syn-compressional setting, pinch out toward structure crests, indicating that drilling along the flanks could enhance exploration success. The Cretaceous section is divided into Upper and Lower intervals: the Upper Cretaceous is characterized by mostly carbonate facies, while the Lower Cretaceous contains deep marine turbidites with strong exploration potential.

Onshore

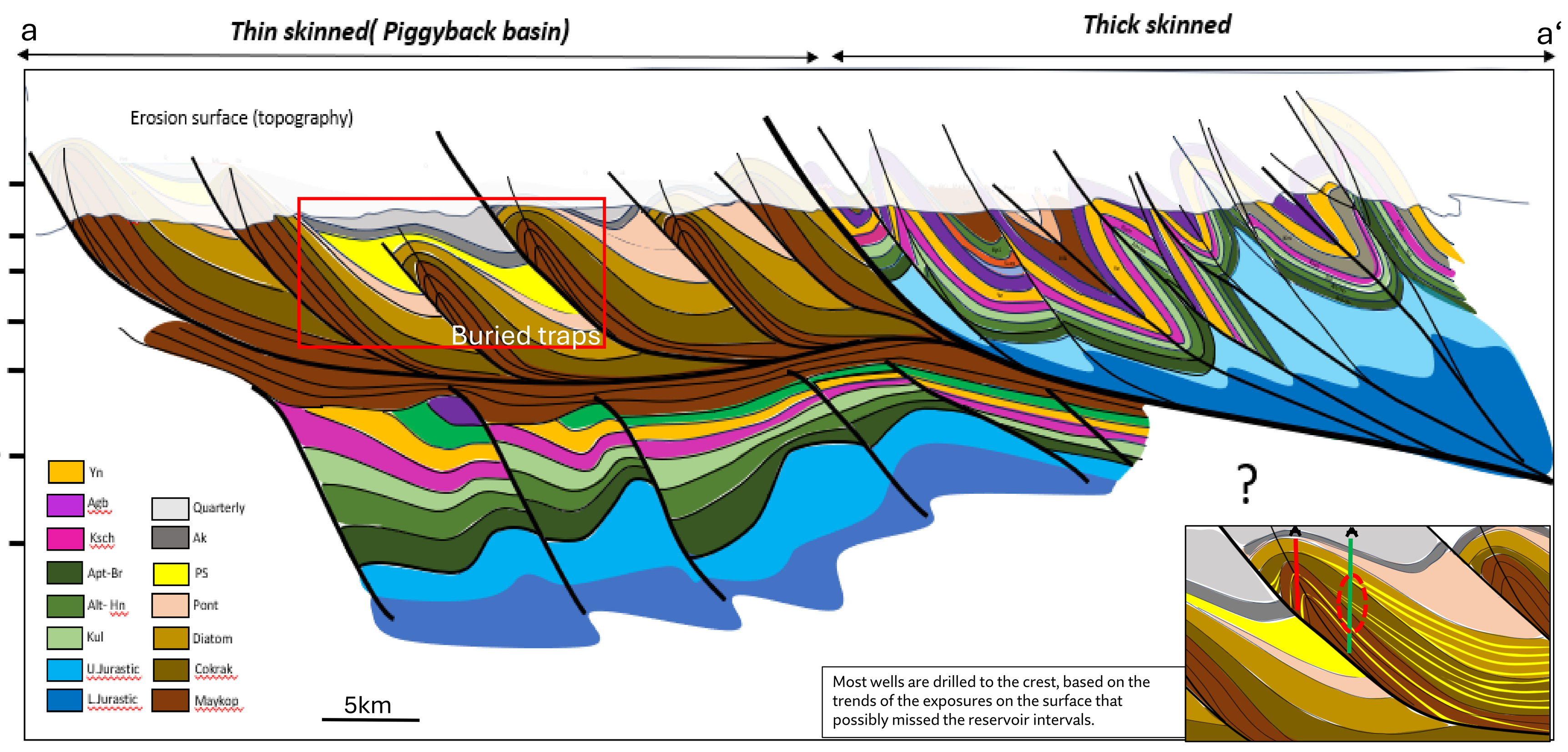

Fig. 3 Modeled cross section based on geological map

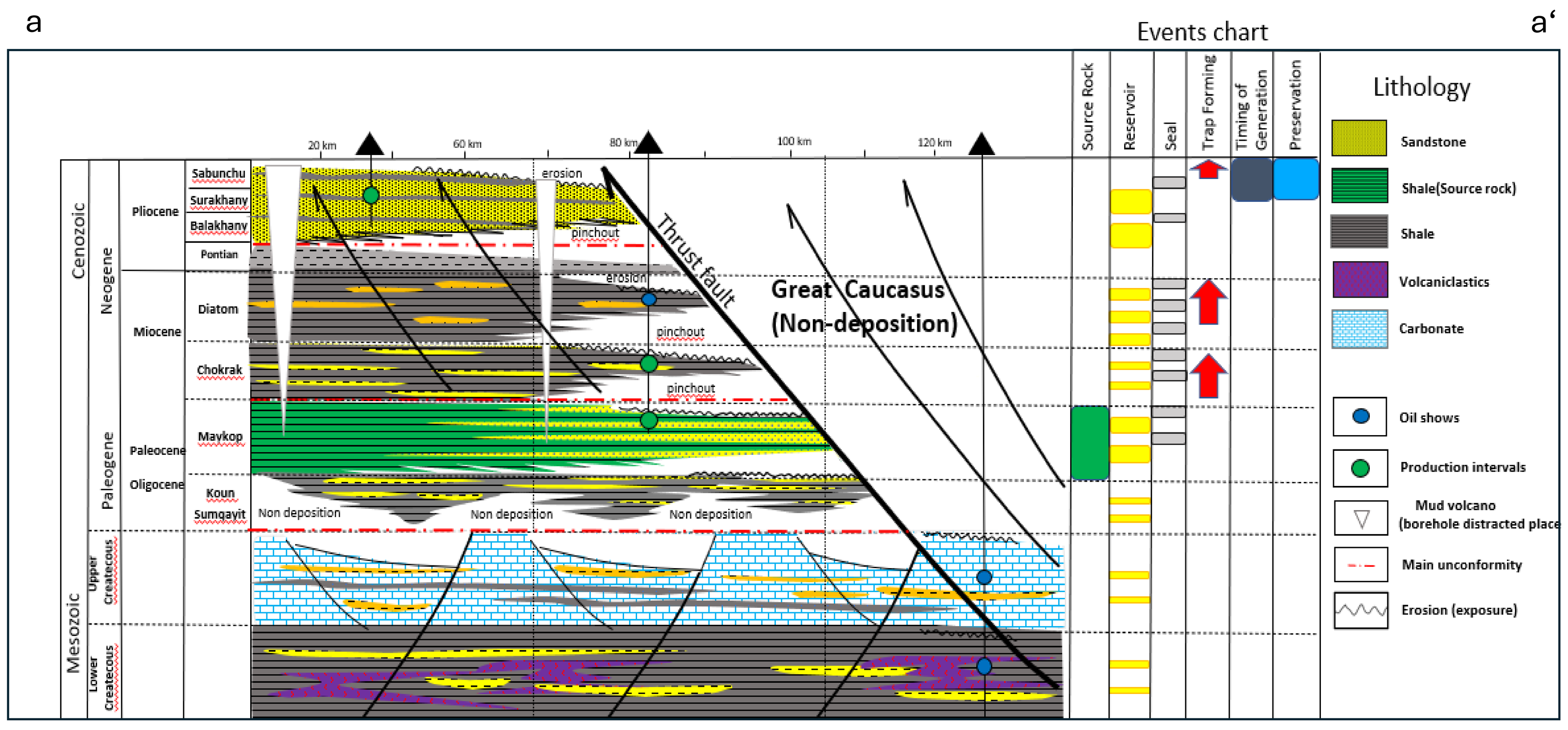

Fig. 4 Chronostratigraphic chart

Offshore

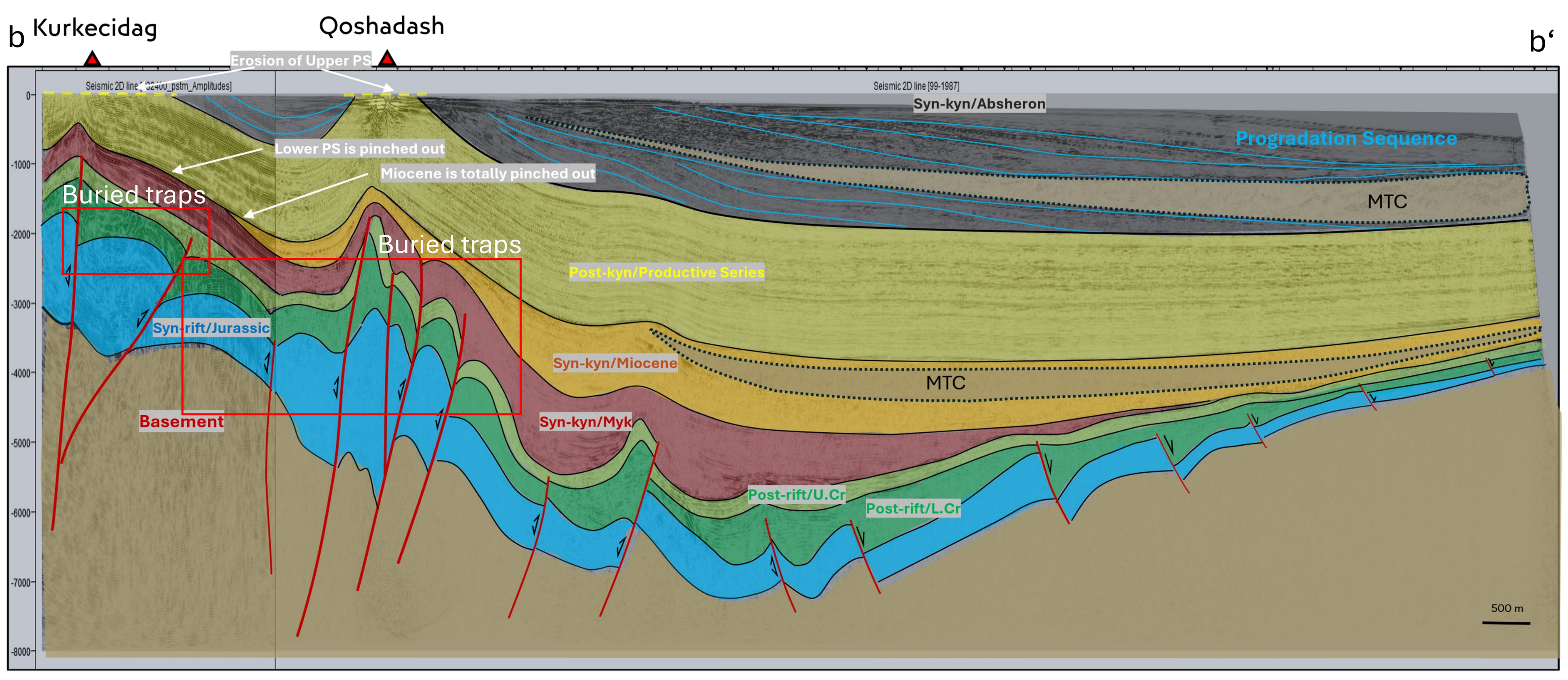

Fig. 5 SW–NE Cross section through Kurkecidağ and Qoshadash prospect

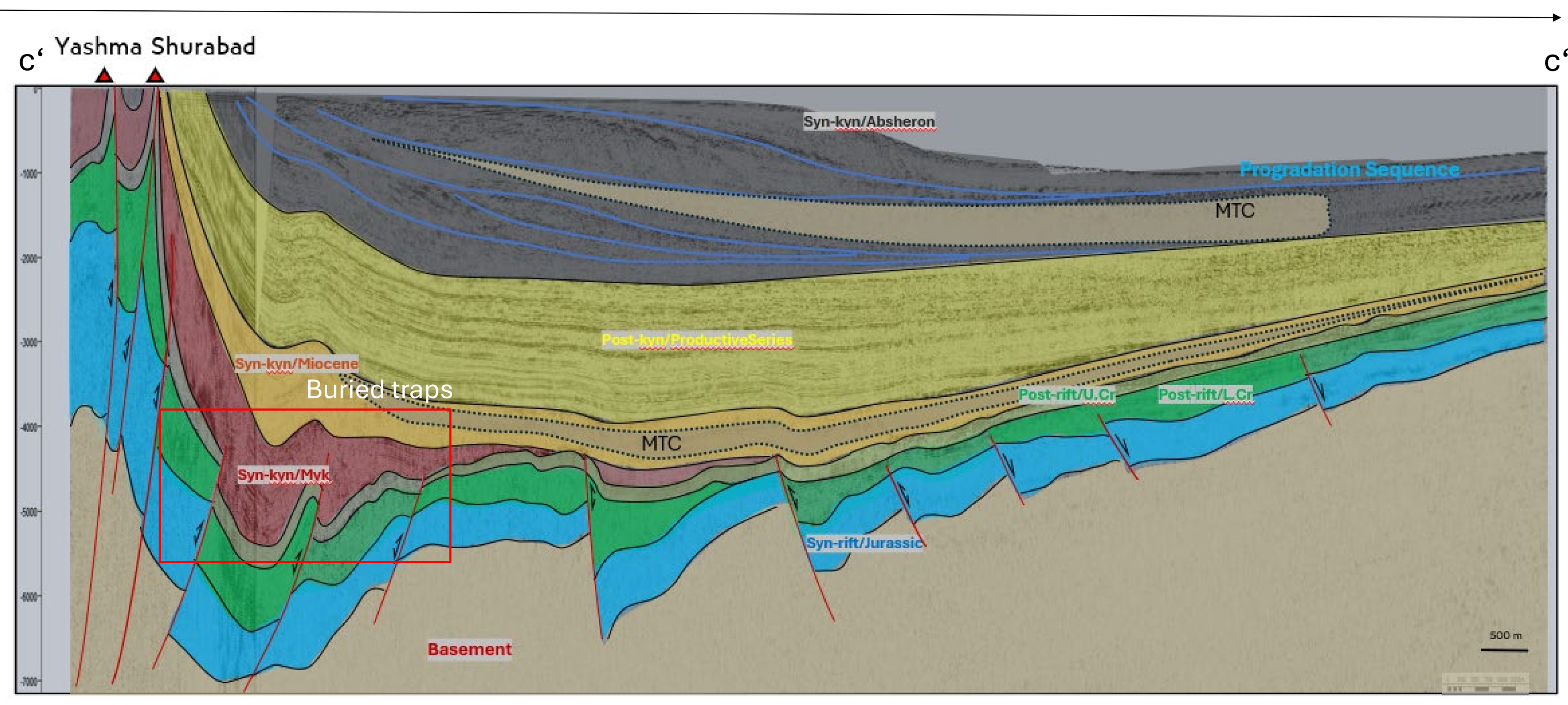

Fig. 6 SW–NE Cross section through Yashma and Shurabad prospect

Conclusion

This study emphasizes the need to focus exploration efforts on buried anticline traps, which are better preserved and less susceptible to erosion and biodegradation. Drilling along the flanks of structures, particularly for targeting Miocene reservoirs, could increase the chances of success.

Recommendation

To fully unlock the potential of these opportunities, acquisition of high-quality 3D seismic data is critical. It will enable effective exploration of these deeper, more promising, potentially hydrocarbon-bearing traps.