

Subsurface Structures Related to the Hydrocarbon Migration and Accumulation in the Afghan Tajik Basin, Northern Afghanistan: Insights from Seismic Attribute Analysis

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Abstract : The Afghan Tajik (foreland) basin, located in the depression zone between mountain axes, is under compression and deformation during the collision of India with the Eurasian plate. The southern part of the Afghan Tajik basin in the Northern part of Afghanistan has not been well studied and explored, but considered for the significant potential for oil and gas resources. The Afghan Tajik basin depositional environments (< 8km) resulted from mixing terrestrial and marine systems, which has potential prospects of Jurassic (deep) and Tertiary (shallow) petroleum systems. We used 2D regional seismic profiles with a total length of 674.8 km (or over an area of 2500 km²) in the southern part of the basin. To characterize hydrocarbon systems and structures in this study area, we applied advanced seismic attributes such as spectral decomposition (10 - 60Hz) based on time-frequency analysis with continuous wavelet transform. The spectral decomposition results yield the (averaging 20 - 30Hz group) spectral amplitude anomaly. Based on this anomaly result, seismic, and structural interpretation, the potential hydrocarbon accumulations were inferred around the main thrust folds in the tertiary (Paleogene+Neogene) petroleum systems, which appeared to be accumulated around the central study area. Furthermore, it seems that hydrocarbons dominantly migrated along the main thrusts and then concentrated around anticline fold systems which could be sealed by mudstone/carbonate rocks.

Keywords : The Afghan Tajik basin, seismic lines, spectral decomposition, thrust folds, hydrocarbon reservoirs

Conference Title : ICAPGRP 2023 : International Conference on Applied Petroleum Geology and Reservoir Petrophysics

Conference Location : Vancouver, Canada

Conference Dates : September 25-26, 2023