Polygonal Faults Implication on Carbonate Reservoir Characterization, 
Case Study: Abu El-Gharadig Basin, Egypt*

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Abstract

Polygonal faults are unique, non-tectonic connected normal faults observed in many sedimentary basins worldwide. Although many scientists consider them as an important pathway for the fluid escaping, the impact of these faults on tight carbonate reservoirs is still poorly defined. The data obtained from the 3D seismic attribute and interpretation in line with the wire line logging interpretation of the Abu El-Gharadig Basin has revealed a network of extensional normal faults that affect the Middle Eocene chalk of the Apollonia Formation. This carbonate is considered a viable gas bearing reservoir characterized by its high porosity and low permeability. The aim of this study is to characterize the development of these faults and define their effect on the drainage character of the reservoir.

Structural analysis of these faults aids in the determination of the permeability and transmissibility of each fault zone. Based on the available data, the structural characterization of these faults is in accordance to the known structural feature “polygonal fault system”. Structural analysis elucidates low values of shale gouge ratio and high values of permeability for most of the fault zones. This could be applied to consider the polygonal faults in the Apollonia Formation as a permeable pathway for the fluid flow which improves the overall drainage character of the carbonate reservoir. This work illuminates the importance of the detailed structural analysis of faults to determine their impact on the reservoir characterization of tight, highly faulted, carbonate reservoirs.
POLYNOMIAL FAULTS IMPACT ON THE CARBONATE RESERVOIR CHARACTERIZATION CASE STUDY: ABU EL-GHARADIG BASIN, EGYPT.


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Abstract

Polyhalite faults are unique, near-kinematically connected normal faults observed at many sedimentary basins worldwide. Although some literature considers them as important pathways for petroleum migration, in others, they are viewed as potential barriers for the development of reservoirs. The objective of this study is to develop a comprehensive understanding of the role of polyhalite faults in the Abu El-Gharedig Basin, Egypt. We present the results of a new report of the polyhalite fault system in the Apollonia Formation of the Abu El-Gharedig Basin.

The Aim of the Study

The objective of the study is to investigate the role of polyhalite faults in the Abu El-Gharedig Basin.

Methodology

The study involved the analysis of geological, geophysical, and core data to identify and characterize the polyhalite faults. Techniques such as seismic interpretation, well data analysis, and core observations were used to understand the distribution, orientation, and geometries of these faults.

Results

The study identified a significant number of polyhalite faults that are likely to act as barriers or pathways for fluid flow. The faults are distributed throughout the study area and exhibit a variety of geometries, which suggests a complex tectonic history.

Discussion and Conclusion

The study highlights the importance of polyhalite faults in the Abu El-Gharedig Basin. Future work will focus on refining the model to better understand the implications for reservoir development and the potential for hydrocarbon migration.

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References


Figure 1: Interpretive seismic lines (A-Line 1010 & B-Line 2027) show the extension of the polyhalite faults along the Apollonia members.