

Structural and Tectonic Evolution of Abu Sufyan Sub-Basin, Muglad Rift Basin, Sudan

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ABSTRACT

Abu Sufyan Sub-basin is located in the northwestern part of Muglad Rift Basin and it is believed that it has the same tectonic evolution history of Muglad Basin. Trend of faults within Abu Sufyan Sub-basin is east-west and it is different from the general faults trend of Muglad Basin (North West-South East). The Muglad Basin evolution history consists of three major episodes of extensional. Each one of those episodes is consisted of three phases; rift- initiation phase, active rifting phase, and thermal sag phase. The first episode occurred during the Early Cretaceous and was the most long-lasting. The second episode occurred during the Late Cretaceous, and associated with many faults. The third episode occurred during Tertiary, and many faults were also initiated during this episode.

The different faults trend of Abu Sufyan Sub-basin compered to faults trend of the Muglad Basin leads to the main objective of this study is to analyze the tectonic evolution and structural settings to identify the possible causes of the different trends. Moreover, to examine other tectonic model of basin development that is not be similar to Muglad Basin. To achieve this target, seismic data were interpreted and structural restoration was also conducted. Three major faults are present within Abu Sufyan Sub-basin; southern fault, northern fault and western fault. Those faults were initiated during the first rift cycle of the sub-basin and reactivated during the other two rift cycles. Analysis of faults trend and behavior and other structural characteristics may indicate that the Abu Sufyan Sub-basin represents a pull-apart basin rather than normal rift basin. Those characteristics are the rhomb-shaped graben, the narrow space between the major bounded faults in the north and south in the east and west compared to the middle part is one of those characteristics. Moreover, the proximity of Abu Sufyan Sub basin to the Central African Shear Zone may also contribute to the formation of the pull-apart Abu Sufyan sub-basin and the unique faults trend.

This study suggests that the Abu Sufyan Sub-basin is a pull- apart structure that formed mainly by a dextral oblique movements in the Late Jurassic to Early Cretaceous. Trend and type of faults within the sub-basin is mainly controlled by the nature of the basin and the direction of movement. In the light of this finding we highly recommend changing the exploration strategy in the area by considering the vision of this paper.