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Structural setting and tectonic evolution of the Gabal Shabrawet area and environs, north Eastern Desert of Egypt

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1 Introduction

The study area is located at the northern tip of the Gulf of Suez rift, west of the Great Bitter Lake. It represents the extreme eastern sector of the Cairo-Suez district, north Eastern Desert of Egypt. Lower Cretaceous sediments are the oldest rock unit exposed in the area, followed by the Eocene, Oligocene, Miocene and Recent deposits. Syrian Arc ENE-WSW transpressional structures, Cairo-Suez E-W wrenching structures, and Red Sea-Gulf of Suez NW-SE rifting, are the main elements, which influence the structural pattern of the study area.

2 Structural setting

Gabal Shabrawet Proper and Gabal Shabrawet West anticlines constitute a part of the well known Syrian Arc system. Both folds are asymmetrical with NE-SW trends, and SW plunge. The southern flanks are overturned, and dissected by reverse faults. The two folds are composed essentially of Cretaceous sediments. The area between them represents a shallow syncline, filled with a thick sequence of clastic sediments of Late Cretaceous-Early Eocene. West of this area, Upper Eocene rocks are affected by E-W trending folds. Other folds are parallel with NW-SE trending faults occur in the Upper Eocene, Oligocene, and Miocene sediments, especially in the south, and southwest. West Gabal Geneifa, and south Gabal Gharra, doubly plunging anticlines are two major folds related to these structures. Faults dissecting the area are of two conspicuous trends: NE and NW. NW faults are prevalent and intersect the NE faults indicating that the NE faults are older. The sense of movement on these faults is generally normal and dips towards east, with a throw increasing towards south. However, right lateral displacements were observed. NE faults accompany the Shabrawet folds, and have the same age. Many unconformity surfaces were determined within and between the rock units.

3 Tectonic evolution

The structural pattern greatly influenced by faulting and to a lesser extent by folding and unconformities. NW trending faults are pronounced, and disrupt the NE trending faults. The later are related to the Red Sea-Gulf of Suez rifting of Early Oligocene-Miocene age. NE faults are parallel to Shabrawet fold axes, and not traced in the Miocene sediments. Consequently, the existence of NE oriented faults as early as Late Cretaceous with repeated reactivation during the Eocene to Late Oligocene time is expected. Two types of folds are distinguished, Syrian Arc folds, and fault-parallel folds *Youssef (1968)*. Folds related to the Syrian Arc are the Shabrawet anticlines. These folds are formed during a phase of Alpine Movement in Late Cretaceous-Early Tertiary time *Moustafa and Khalil (1989)*. Folding of Eocene deposits west of the area suggests that this phase lasted until the Late Eocene, or even Oligocene time. Fault-parallel folds extend NW-SE, and are associated with the NW fault trend. Their origin is attributed to local compression associated with faulting *Barakat and Aboul Ela (1971)*. Post Miocene-Pliocene rejuvenation of NW trending faults, with right lateral movement, may explain the formation of these folds as drag folds. In Late Eocene, and Early Miocene times respectively, Shabrawet folds and Gabal Geneifa were positive areas.

4 Summary and conclusions

The study area is strongly affected by faulting which controls the topographic configuration of the area. NE-SW, and NW-SE are the main fault trends. Folds are either related to the Syrian Arc system or to the transpression accompanying the reactivation of NW faults. A phase of Alpine Movement and the Red Sea-Gulf of Suez rifting are the main tectonic events, beside the effective structural grain of the Cairo-Suez district.

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