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Structural and basin evolution in Miocene time, southwestern Gulf of Suez, Egypt

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With 14 figures

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Abstract: Seismic-facies analysis and the subsurface tectonic evolution of the Western Sub-Basin (WSB) of the Gulf of Suez, Egypt, were studied by seismic reflection data of 45 seismic lines. Eight of these lines were selected to illustrate the structural framework and depositional history of the WSB supported by the composition, velocity and vertical seismic profile (VSP) logs of ten wells. The analysis of two way time (TWT) structure-contour maps and rose diagrams revealed that the Miocene strata are dissected by NE-SW trending faults of the Morgan Accommodation Zone (MAZ). North of this zone, a general dip towards the northeast is recognized, south of this zone, the regional dip is towards the southwest. The complex structural framework was the main factor controlling facies changes of the syn-depositional Miocene units along the study area.

Key Words: Structure, seismic interpretation, facies, basin-evolution, salt ridges, syn-rift sedimentation, accommodation zone, Gulf of Suez, Egypt.

Introduction

The Gulf of Suez rift is a Neogene continental rift that developed by separation of the African and Arabian plates in the Late Oligocene-Early Miocene. It represents a northwest-elongated structural depression at the northern end of the Red Sea that is 350 km long and ranges in width from 52 km in the north to 90 km in the south. Opening of the Suez rift initiated in response to N60E extension before Early Miocene times (Robson 1971; Garfunkel & Bartov 1977; Lyberis 1988; Moustafa 1993; Patton et al. 1994; Yones & McClay 2002). Siedner (1973), and Meneisy & Kreuzer (1974) concluded that the basaltic igneous activity in the Gulf of Suez basin is of Late Oligocene-Early Miocene age. The basalts are overlain by Early Miocene sediments.

The tectonics of the Gulf of Suez was discussed by many authors, resulting in different models:

The first model considers the Gulf of Suez as a major graben formed through tension (Busk 1945; De-Sitter 1956; Said 1962; Barakat 1982). A second hypothesis explains the formation of the Gulf of Suez by compressional stress (Willis 1928; Holmes 1945; Meshref et al. 1976). A third opinion proposes that the Gulf of Suez-Red Sea rift was formed by contemporaneous uplift and subsidence of different fault blocks (Swartz & Arden 1960). A fourth opinion considers regional updoming and strike-slip faulting as cause for the formation of the Gulf of Suez (Tromp 1950). Youssef (1968) suggested that Early Eocene arching reached its climax in Oligocene time, when strike-slip movements along the old wrench faults were renewed.

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