

Impacts of the Inherited Tectonic Fabrics and Sedimentary Thicknesses on the Northern Gulf of Suez Rift Development

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ABSTRACT

The world-class extensional rift system of the Gulf of Suez (GOS) displays asymmetry through the influence of some inherited tectonic fabrics of intricate structures and the accompanying pre-rifting sedimentary thickness variations. This work delineates these structures and their effect on the development of the northern GOS and sediment distribution. The surface geology is incorporated with data from all well penetrations and various seismic vintages. Three Pre-Miocene structural belts are delineated in the northern GOS. The Late Cretaceous-Early Eocene Wadi Araba fault-fold belt represents the first inherited discontinuity from the south and is characterized by a thinning of the Pre-Miocene sedimentary section to ca.1-1.5 km from ca.3-3.5 km in the south. This structural belt defines an accommodation zone, which witnessed the abortion of the central GOS half-graben and swive of the northern half-graben development toward the structural high area on the west side rather than the jump toward the thick and the passive area on Sinai side. This demonstrates the preference of the GOS rift to propagate in a thinner crust. The low extension rate in the northern basin, coupled with weak rifting during the deposition of the Middle Miocene Kareem-Belayim formations resulted in a development of numerous faults of small displacements along the N60°W-direction. The second inherited discontinuity is the Jurassic-Tertiary Wadi Ghoweiba-Gebel Somar belt, which defines a distinction between ca.1.5-2.5 km thick sediments in the south and ca.4-5 km thick strata in the north. As the northward propagating GOS rift approached this belt, it experienced a sudden loss of rift subsidence, termination of the rift shoulder and rift border fault, and a deviation in the NE-direction through the nucleation of the NE-trending Sukhna coastal fault with considerable loss of displacement from 5400 m on the rift border fault to 1370 m on the Sukhna coastal fault. Shallow gulf water invaded as far as 58 km along the Wadi Ghoweiba hanging wall. Further to the north, the GOS intercepted three successive Jurassic-Tertiary fault-fold belts of the Sukhna-Misalla, Saad El Naam and Wadi El-Ramliya-Geddi Pass with a thin pre-Miocene section. The GOS rift dissipated over a vast area and formed swarms of long NW-striking extensional faults that are spreading west to the Nile Valley. The shallow gulf water invaded 39 km along the NW-trending graben of Wadi Hagul before termination at the town of Suez.