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Rift Offsets, Gulf of Suez, Egypt

Structure and stratigraphic mapping in the northern half of the Gulf of Suez (GOS) documents two en echelon, rift-parallel (Clysmic trend) rift segments. The segments are right stepping and share a zone of overlap, which extends southward from the southern border of the Wadi Araba structure on the western shore of the gulf to the north end of the Abu Durba block on the east side of the gulf. The spatial relationship of the two segments defines the central GOS rift offset, and the structural depression linking the segments in the area of overlap forms a rift-offset zone.

Within the rift-offset zone, surface and subsurface data record a variety of structural trends, with two being dominant: the Clysmic trend and a north-north-northeast trend. Bimodal fault populations, with similar orientations relative to the rift axis, are found in better exposed, right-stepping rift offsets (e.g., Rhinegraben, Rio Grande rift) and document the departure from the dominantly plane strain of rift segments oriented perpendicular to the extension direction to three-dimensional strain in rift segments oriented obliquely to the extension direction. The left-lateral component of slip documented on some of the oblique-trending faults in the central GOS offset (e.g., Abu Durba-Araba fault) is kinematically consistent with motion across a right-stepping rift offset.

Another potential rift offset, though less well constrained, also with a north-south trend may be present south of Gebel Zeit. This rift and the central GOS rift offset provide a model for the opening of the GOS in which north-south rift-offset zones link Clysmic-trending rift segments, imparting a regional zig-zag pattern to the initial rift configuration.

Recognition of offset zones and their associated fault fabrics is essential for effective exploration of rift basins. For example, the alignment of producing fields and elongation directions of individual fields in the central GOS offset are anomalous relative to those of other producing trends in the Gulf.