Structural Modeling and Kinematic Restoration of the Corsair Normal Fault Trend, Northwestern Gulf of Mexico

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ABSTRACT

The Corsair normal fault system of the northwestern Gulf of Mexico is a 80 km wide zone of mainly normal faults that parallels the Texas coast for a distance of 400 km from the U.S.–Mexico border to the Sabine bank area and is part of the updip extensional component of the downdip shortening areas of the Port Isabel and Perdido passive margin fold belts in the deepwater Gulf of Mexico. Seismic interpretation and kinematic restoration study of the Miocene Corsair normal fault trend was carried out on three, regional, northwest-to-southeast-striking seismic lines ranging in length from 200 to 300 km in order to better understand the relationships between faulting, salt withdrawal, salt diapirism, subsidence, and sediment loading of this rift-like feature. The three lines were restored in MOVE software using the vertical simple shear model. Seismic data show two detachments: a lower detachment along the top Jurassic at depths of 12,000 to 15,000 m and an upper, curving detachment along the level of the Anahuac shale and Middle Miocene unconformity at depths of 6000 to 7000 m. The lower Jurassic detachment follows a thin salt detachment and remains sub-horizontal. The Miocene detachment is both shale based to the west and salt-based to the east as it descends over a vertical distance of 5 km into a, symmetrical, 11 km deep depression that is 170–190 km wide. The reconstructions show that the symmetrical depression formed into response of flattening of an original salt wall associated with the lower Jurassic detachment and that updip normal faults of the Corsair system are kinematically-linked to the zone of downdip thrust faults and associated salt diapirism. The salt wall flattened at great depth and space was generated to form the shallow-level depression. The depression is structurally-defined by 60-km-wide zone of Corsair normal faults to the west and a 25 km wide zone of thrust faults and salt-cored folds to the east. Sediment loading from the Texas margin has likely played a major role in the continued, symmetrical deepening of the trough.

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