Red Sea Salt Habitat as an Analogue for Rift-Drift Transition in the Gulf of Mexico

T. Heyn, J. Pindell, M. J. Hoggard, A. Goswami, K. R. Reuber, and C. K. Steffensen

ABSTRACT

A late Berriasian end-rift unconformity in the southeasternmost Gulf of Mexico (GoM) indicates when drift ended, but oceanic crust (OC) ages remain an interpretation from plate reconstructions and seismic horizon mapping. Louann salt (165–170 Ma) was split into conjugate portions by post-salt drift, but horizons immediately above salt cannot be mapped from wells onto OC without interpretational uncertainty. Thus, early suprasalt strata could also have been split by drift, allowing for an alternative type of breakup model with later initial spreading than is often assumed. Using the Red Sea (RS) as an analogue, we explore whether breakup (drift onset) may have occurred after marine sediments began accumulating on stretching Louann. Jurassic suprasalt extension exceeds downdip compression and thus must be balanced by tectonic extension principally within the outer marginal trough (OMT). The OMT, between hyperextended continental crust and OC, represents the most severely strained domain (consisting of rifts, magmatic segments, and occasional exhumed mantle). The OMT extended below stretching salt by magmatic addition and faulting; drift which began as magmatic processes became dominant. RS (Neogene) and GoM (Jurassic) detached suprasalt rafts are similar, as are base-salt unconformity geometries marked by small-offset widely distributed faults and progressively larger-offset faults toward the final rift axis. The tear point of initial drift migrated in both the GoM and RS and was accompanied by time-transgressive breakup unconformities. The RS provides depth proxies for early GoM OC, and suggests salt precipitated close to global sea level (< -120 m). Syn/post salt extension caused deepening of top salt and suprasalt cover to ~ -1 km. Breakup caused further deepening in GoM (-2.7 km) when salt/cover was split, as suggested by RS bathymetries; juvenile OC formed isostatically lower than the conjugate margins with salt. OC usually forms below the top salt level, allowing salt to flow some distance onto OC.

Heyn, T., J. Pindell, M. J. Hoggard, A. Goswami, K. R. Reuber, and C. K. Steffensen, 2021, Red Sea salt habitat as an analogue for rift-drift transition in the Gulf of Mexico: GeoGulf Transactions, v. 71, p. 421.

NOTES