

Bird, D. E., 2003, **Gulf of Mexico evolution and structure**: Houston Geological Society Bulletin, v. 45, n. 7, p. 25-27.

Kinematic reconstructions of tectonic plates can be facilitated by a priori knowledge of basin shapes, relative ages and extents of key horizons and structures, and geophysical constraints such as gravity, magnetic and seismic data. Still a "global view" is necessary to ensure theorized kinematic solutions are compatible with neighboring regions.

Over 100 seismic refraction profiles, and over 70 basement or near-basement well penetrations, were used as control and calibration for interpreting open-file magnetic anomaly profiles over the Gulf of Mexico basin and northern Gulf coastal plain. The shape of the Gulf of Mexico basin was interpreted by estimating basement depths from these profiles. The derived basement surface was imported into 12 mega-regional gravity and magnetic modeled cross sections. These formed a skeletal network that integrated gravity, seismic, well and magnetic data into regional slices through the basin that, in turn, were modified to support the basement interpretation.

In some respects, results from the basement analysis reveal no surprises. The central part of the basin deepens to the west from about 9 to over 15 km, and the basin probably formed by counter-clockwise rotation of the Yucatan Block over a 20 My period between approximately 160 and 140 Ma. However, two significant results related to basin formation are revealed by the basement interpretation. First, the existence of a NW-SE Bahama fracture zone through southern Florida is not supported. Second, a NW-SE trending free air gravity anomaly high, that dominates the Keathley Canyon protraction area, may be evidence of a late Jurassic mantle plume. The conjugate hotspot track to the Keathley Canyon anomaly is related to another prominent free air gravity anomaly, which is concentric with the coast of the Yucatan Peninsula, through the center of the basin.

Hotspot tracks are proposed to exist in the central Gulf of Mexico based on their size, shape and alignment with hotspot-referenced North American Plate and Yucatan Block motions between 160 and 140 Ma. Size and shape are modeled in cross sections constrained by gravity and seismic refraction data, and rise approximately 3 to 4 km over the surrounding basement.

The hotspot tracks:

- can be restored by 20° of relative rotation between the North America Plate and the Yucatan Block about a pole located near 24°N and 81.5°W,
- define the southern limit of autochthonous salt in the northern Gulf Salt Basin and the northern limit of autochthonous salt in the Campeche Salt Basin,
- require 8 to 10 My to form in the hotspot reference frame, and
- define northern, southern, and eastern limits of oceanic crust in the basin.

Therefore, the basin formed by:

- 8 to 10 My of continental extension and salt deposition during about 20° of counter-clockwise rotation of the Yucatan Block relative to North America, followed by
- 8 to 10 My of sea floor production during continued counter-clockwise rotation of the Yucatan Block (approximately an additional 20°).