Tectonic Significance of the Middle Miocene Unconformity of the Campeche Salt Area of the Southern Gulf of Mexico

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Abstract

The Cenozoic strain history of the Campeche salt segment is revealed by the Middle Miocene unconformity (MMU). NE–directed contractional (Chiapanecan orogenesis) and NW–directed extensional (Catemaco gravity sliding) phases partially overlapped in time. The MMU shows NW–SE and SW–NE trending folds, is offset by SW–NE normal faults and tears, and corresponds with the tip of allochthonous salt-sheets. Miocene erosion along the MMU occurred during northward tilting and uplift. Tilted MMU outcrops flanking the Chiapas massif indicate Pliocene-present uplift caused additional erosion. Orogenesis had a Middle Miocene high-strain pulse (C3) with thrusting, squeezed diapirs and erosion. The onset of tilting corresponds to E4 extension in the Catemaco slide which moved NW perpendicular to the Chiapanecan contractional direction (0–12 Ma). Extension caused diapirs to widen and "fall" between rafts, and out-paced the ability of Campeche salt to re-supply diapirs even though Chiapanecan-deformation (C4) persisted. Weak diapirs became the locus of normal faults during tilting as a syn-extensional sequence accumulated on diapirs /MMU. Mesozoic gaps correspond with the most extended diapirs and transtensional bends in tears. Paleogene C2 folds formed during early Chiapanecan (Laramide) orogenesis as North America (Chiapas) moved W-ward along the Chortis microplate (~46 Ma; 600 km between trench and Campeche salt), or they represent simple halokinesis. Chiapanecan and Catemaco strains were superimposed on C2 folds. Downward mantle flow (drawdown above Farallon) beneath the Gulf and uplift above the Mexico-Cocos plate interface caused sliding. Water-loaded oceanic residual depths reveal <2 km of modern drawdown above the Farallon slab (mapped on tomographic models). Shallow subduction of the Cocos Plate in the wake of Chortis forced the Chiapas foldbelt to uplift and push the Chiapas Massif (300 km from trench) towards Yucatan (C3/C4). Miocene erosion was of relief from structural thickening in the Chiapas FB and uplift from the shallow-dipping Cocos Plate.