

Late Cretaceous – Cenozoic Evolution of the North America – Caribbean Plate Boundary Zone in the Mantle Reference Frame: Mexico, Central America, and Northwest Caribbean

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Abstract

Plate kinematics, geochronology, thermochronology, paleomagnetism, structural sections, and source–sink depositional models are integrated to establish a framework for the evolution of S. Mexico, Central America, and the NW Caribbean since the Late Cretaceous (K). Tectonic developments include: (1) Late K collision of Antillean Arc (Nicaragua Rise–Jamaica) along eastern continental Chortis and S. Chiapas–Belize margins; (2) end–K dislocation of continental Chortis from Oaxaca, due to flat-slab subduction and plate-interface traction; (3) Cenozoic transpressional migration of Chortis–Nicaragua Rise–Jamaica (Caribbean Plate) along S. Mexico–N. Guatemala; (4) progressive eastward encroachment of subduction along S. Mexico in the wake of Chortis, causing uplift/erosion of Xolapa Belt (since Eocene), Guichicovi (since Oligocene), and Chiapas Massif (since Middle Miocene). Chiapas Massif rotated 10–20° clockwise in the Middle Miocene during Chiapas Foldbelt shortening, but Massif uplift was greatest since 10 Ma as flat-slab subduction migrated into Chiapas. Since ~11 Ma and ~4 Ma, respectively, Macuspana and Comalcalco basins have formed by north-northwestward downslope gravitational detachment of the northern portion of Chiapas Foldbelt on Bajocian salt. This updip extension is manifested downdip as compression in the more northerly Campeche Salt Basin. Paleocene–Middle Miocene clastic sediment passed from plate boundary sources to Veracruz and Chiapas and beyond, without topographic impedance by the Tuxtla High or Chiapas Massif. The Nanchital conglomerate of W. Chiapas Foldbelt comprises proximal channels feeding deeper fan reservoirs in offshore Sureste Basin. Felsic igneous and metamorphic components of this conglomerate were once assumed to derive from Chiapas Massif. However, zircon U–Pb dating shows correlation of Nanchital clasts with igneous exposures in SW Tehuantepec, indicating the Nanchital catchment area reached south of the Massif until late Middle Miocene, after which Chiapas Massif and Foldbelt likely became the dominant clastic sources. Our studies provide a framework for understanding clastic input to Sureste Basin through Cenozoic time.