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# MESOZOIC TECTONOSTRATIGRAPHIC EVOLUTION OF MEXICO

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The terrane analysis of the Mesozoic succession of Mexico herein presented is based on data obtained from: 1) Morphotectonic analysis; 2) Paleogeographic evolution of the Mesozoic succession in terms of tectostratigraphic (paleogeographic) domains and petrotectonic assemblages; 3) Paleobiogeographic provinces and realms of latitudinally significant groups of micro (calpionellids and Radiolaria) and megafossils (buchias and ammonites), and 4) Biochronologic studies. Two major plate-tectonic phases are recognized: 1) middle Jurassic (late Callovian) accretion and sinistral shearing, and 2) Bathonian-Bartonian oblique convergence and transcurrence (transpression). Six tectonic hiatuses corresponding with the local absence of Pliensbachian-Toarcian, Oxfordian, middle Kimmeridgian, late Tithonian. Hauterivian-Barremian, and late Turonian-Campanian sediments are recognized in the stratigraphic record. These hiatuses are coincident with changes in convergence of the Kula-Farallon plate.

Morphotectonic analysis of Mexico based on the visual examination of Landsat imagery suggests that the deformation of the Mexican Cordillera is the culmination of the kinematics of strike-slip tectonics in the basement.

Major segments of the Mexican-Cordilleran orogenic belt (Victoria, Huayacocotla, Juarez and Sierra Madre del Sur) are bounded b WNW trending transcurrent faults. Late Triassic-Early Jurassic petrotectonic assemblages define three terranes; the accretion of the Huayacocotla, Juarez and Sierra Madre del Sur terranes was followed by lateral translation, in the late Callovian, of the Huayacocotla terrane from higher paleolatitudes (Boreal paleobiogeographic Realm). This terrane contains Middle Jurassic (late Bathonian-early Callovian) paleobiogeographic elements (e.g. ammonites of the genus *Kepplerites*) indicative of Boreal paleolatitudes. The lateral translation of the Juarez and Sierra Madre del Sur tectonostratigraphic terranes took place in the Early Cretaceous (Hauterivian), and

Late Cretaceous (Turonian-Campanian), respectively as they contain Late Jurassic and Early Cretaceous pantanelliid Radiolaria indicative of Northern Tethyan and Central Tethyan paleolatitudes.

The strike-slip fault system consists of multiple, subparallel fault sets displaying four primary directions of transport: N60W, N40W, N15E, and N85W. These fault sets formed during times of plate interactions, mainly oblique subduction, and reflect the convergence of the Kula/Farallon plate through the Mesozoic. Oblique subduction and transcurrence (transpression) are the mechanisms responsible for the deformation of the Mexican Cordillera. The Mesozoic plate-tectonic evolution of Mexico udnerwent five paleogeographic phases corresponding with (a) Late Triassic-Early Jurassic convergent margin, (b) Pliensbachian-early Bathonian accretion, (c) late Callovian-Valanginian oceanic opening, (d) mid-Cretaceous development of carbonate platforms, and (e) Turonian-Bartonian convergent margin. Each phase is characterized by its diagnostic tectonostratigraphic domains. These domains resulted from (a) left lateral oblique subduction along the northwest margin of Pangea, (b) interaction between the Kula/Farallon and North American plates, (c) sea-floor spreading in the Gulf of Mexico, and (d) the separation of South America from North America (Hispanic Corridor).

In summary, it is postulated that the Mesozoic paleogeographic evolution of Mexico was governed by: (1) oblique convergence and transcurrence along the western (paleo-Pacific) margin of Pangea; (2) changes in the direction of convergence of the Kula/Farallon plate in relation to the North American plate; (3) the drifting phase associated with the separation of South America from North America; and (4) sea-floor spreading in the Gulf of Mexico and the migration of the Yucatan block to its present geographic position.

The aforementioned plate-tectonic interactions of ancestral (Mesozoic) Mexico resulted in (1) the generation of a left lateral strike-slip fault system since the mid-Jurassic; and (2) stratigraphic hiatuses of variable duration in the Jurassic and Cretaceous succession which reflect times of plate interactions (oblique subduction and spreading), and coincide with changes in the direction of convergence of the Kula-Farallon plate. Three fundamental consequences of the strike-slip system in the basement were: 1) The translation of tectonostratigraphic terranes from higher (northwestern Pangea) to lower paleolatitudes (present-day east-central Mexico) in a south-southeastern direction. These lateral movements are responsible for the overlap position of Mexico with respect to South America in Permo-Triassic reconstructions. 2) Transpression was the dominate tectonic regime in Mexico since the Late Callovian, controlling the sedimentation and deformation of the Mesozoic sedimentary cover, via the reactivation of the strike-slip fault system in the basement. 3) The generation of distinctive morphotectonic features that relate the kinematics of the fault system in the basement to the deformation of the Mesozoic sedimentary cover.

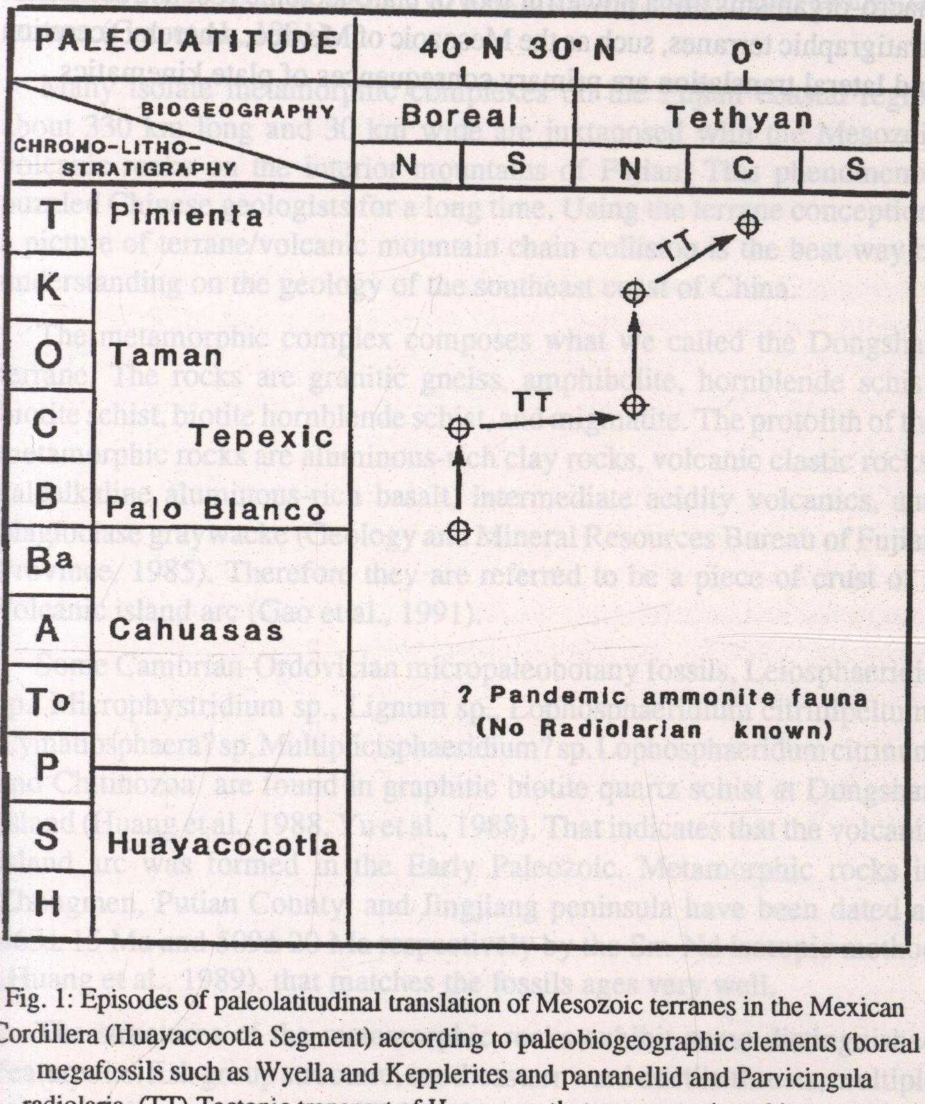


Fig. 1: Episodes of paleolatitudinal translation of Mesozoic terranes in the Mexican Cordillera (Huayacocotla Segment) according to paleobiogeographic elements (boreal megafossils such as Wyella and Kepplerites and pantanellid and Parvicingula radiolaria. (TT) Tectonic transport of Huayacocotla tectonostratigraphic terrane.

Paleobiogeographic juxtaposition such as the occurrence of Boreal Late Bathonian-early Callovian ammonites, as well as the Oxfordian-Kimmeridgian Northern Tethyan radiolarians and the late Tithonian Central Tethyan radiolarians in the faunal elements of the Huayacocotla segment of the Mexican Cordillera are interpreted as the result of lateral translations of tectonostratigraphic terranes (Fig. 1) during the Middle Jurassic, Late Jurassic, Early Cretaceous and Late Cretaceous.

Morphotectonic analysis combined with paleolatitudinal investigations based on the distribution of paleobiogeographic provinces of micro and macro-organisms are a powerful tool in plate-tectonic reconstructions of stratigraphic terranes, such as the Mesozoic of Mexico, whereby accretion and lateral translation are primary consequences of plate kinematics.