Cuba-Bahamas Arc/Margin Collision: Constraints on Timing of Suturing

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Post Oak Doubletree Inn, 2001 Post Oak Blvd.

Constraints on timing of suturing include (1) stratigraphic data, both surface and subsurface, (2) isotopic age data from the southern metamorphic belt, which originally consisted of sediments deposited at the southern edge of the Bahamas/Florida margin, (3) seismic data in the carbonate foreland (e.g., Bahamas, Florida, and southeast Gulf of Mexico), and (4) seismic data from offshore western Cuba. These data are consistent with a scenario whereby suturing took place between the Late Cretaceous and the Late Eocene with a more quiescent period in the early Paleocene.

(1) The Late Cretaceous initiation of suturing and northward movement of the thrust belt is represented by widespread erosion of Turonian-Santonian margin sediments and ubiquity of a Late Cretaceous unconformity overlain by Campanian-Maastrichtian flysch. Early Paleocene marls record a cessation (or slowing) of thrusting. By the Late Paleocene, vigorous thrusting resumed and waned progressively from west to east from early to latest Eocene. Although this scenario can be argued from surface data alone, it is reinforced by the addition of new, deep-well penetrations drilled by Soviet/Cuban teams in northern Cuba.

(2) Isotopic age data (K-Ar) generated by Soviet and American teams show cooling ages associated with a pervasive Late Cretaceous thermal overprint related to initial suturing. Age dates from the southern metamorphic belt (derived from abyssal plain sediments deposited over stretched North American basement) yield dates from 45-90 Ma, but possess a mode at 65-70 Ma.

(3) Reflection seismic data from the carbonate foreland north of Cuba show significant reactivation of basement faults from the Late Cretaceous-Early Tertiary in response to arc/margin convergence from the south. This reactivation is manifested as tilted fault blocks, upthrown fault blocks, foreland bulges, and faults that propagate up through the overlying carbonate section. Vertical displacement on these faults in Florida ranges up to 1500 ft.

(4) Reflection seismic data from offshore western Cuba over the frontal thrust and associated foredeep sediment wedge to the north, interpreted with well-constrained Gulf of Mexico correlation horizons indicate the sediment wedge consists of a thick sequence of Upper Cretaceous and Eocene flysch.

MARK HEMPTON - Biographical Sketch

Mark Hempton was trained as a field geologist at SUNY-Albany where he earned a Ph.D. in 1982 after mapping in the Bitlis thrust belt of southeastern Turkey. After graduating from Colgate University in 1976 he mapped faults in the Sierra Nevada foothills for Woodward-Clyde Consultants, San Francisco. During his graduate school career he consulted for Turkish Petroleum, Amoco, and Earthsat. Since 1984, Hempton has been a geologist with Shell Oil Company. Currently he is with the international subsidiary, Pecten, and exploring in West Africa.