Erosion of the Florida and Yucatan Carbonate Margins of the Gulf of Mexico: Subaqueous or Subaerial?

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ABSTRACT

High resolution multibeam bathymetry along the carbonate-dominated passive margins of the Florida and Yucatan platforms in the eastern Gulf of Mexico (the Gulf) reveals steep-walled canyons, sinkholes, and wave cut benches in present day water depths of more than 500 m. Subaqueous marine processes are inadequate to explain these features that are typical of subaerial erosion. Subaerial erosion as the cause for these features became a possibility with the idea that the Gulf was isolated from the Atlantic Ocean by collision of the Cuban Arc with the Florida-Bahamas block near the Paleocene-Eocene boundary. The isolation may have lasted on the order of one million years. Evaporation caused the level of the Gulf to fall. Isolation was enhanced by isostatic rebound of the basin and its margins as the water level descended. At its climax, the Gulf reached about 2000 m of drawdown to become a landlocked basin containing a residual body of water.

The subaerially exposed carbonate platforms of Yucatan and Florida developed extensive karst surfaces with wave cut benches on their outer fringes as the water level dropped. Surface and subsurface meteoric water migrating from across the platforms excavated steep canyons through the escarpments, and wave action in the remnant water body caused erosional retreat of the escarpments. The low stand ended when the barrier separating the Gulf from the Atlantic Ocean was breached and water from the Atlantic poured through the Florida Straits, cutting a deep canyon through the suture zone between Cuba and the Florida/Bahamas block, and into the deep water Paleocene and Cretaceous carbonates west of the suture zone.

Studies of the eastern Gulf prior to proposal of the Paleocene-Eocene drawdown did not consider the possible subaerial origin for erosional features observed on the Florida and Yucatan carbonate ramps and escarp-

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ments. Evidence presented herein supports the interpretation of subaerial erosion and advocates the re-examination of conclusions from earlier studies.

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