Cenozoic Evolution of Northern Gulf of Mexico Shelf–Upper Slope Deposystems and Shelf Edges

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EXTENDED ABSTRACT

Northern Gulf of Mexico sediment accumulation rates derived from thousands of age calibrated biostratigraphic and lithostratigraphic well reports (Fillon, 2007) record depositional trends spanning the entire Cenozoic. Apportioned among 44 Cenozoic chronosequences (chrons), these data vividly trace the evolution of one of the world's great shelf-slope siliciclastic deposystems through a series of continental shelf building depositional cycles.

The Paleocene-Eocene depositional cycle (PEDC of Fillon et al., 2005) marked the first episode of shelf building in the Cenozoic. It began during early Paleocene chron 44 (65.4–62.5 Ma), less than 1 Ma after the K–Pg boundary event. Small, isolated pre-Wilcox deltas began forming during chron 44, punctuating the relict Cretaceous shelf margin with discrete lobe-shaped accumulation rate maxima. These small deltas stretched in an arc that extends from northeastern Mexico to southeastern Louisiana (lower part of Fig. 1A). In middle Paleocene chron 43 time (62.5–59.3 Ma), these early deltas expanded and merged to build larger rapidly aggrading lower Wilcox shelf systems centered at the termini of major ancestral rivers from the Rio Grande to the Mississippi (upper part of Fig. 1A). During the PEDC, aggradational construction of the late Wilcox continental shelf reached a maximum during early Eocene chron 40 (53.6-50.5 Ma) and ended rather abruptly during early-middle Eocene chron 39 (50.5–47.0 Ma), terminated by a regressive episode (Fig. 2) characterized by very low sediment accumulation rates on the shelf. Except during the terminal regression, the PEDC is dominated by aggradational Wilcox shelf building while progradation contributes relatively little to shelf growth.

Two more dominantly aggradational shelf building cycles characterize the remainder of the Paleogene (Figs. 1B and 1C). The middle to late Eocene depositional cycle (MLEDC) began during chron 38 (47.0–44.7 Ma), and culminated in late Eocene chron 35 (40.4–36.8 Ma) when Queen City–Sparta shelf systems attained their greatest thickness and areal extent. The MLEDC terminated abruptly during late Eocene chron 34 (36.8-34.4 Ma) at the beginning of a major regressive episode (Fig. 2).

The final cycle of shelf building in the Paleogene is represented by the Oligoceneearly Miocene depositional cycle (OEMDC), which produced the Vicksburg-Frio shelf system. The OEMDC started out with a major regression (Fig. 2), bringing with it an abrupt switch from the dominantly aggradational shelf building styles of the PEDC and MLEDC to a depositional offlap regime dominated by a significant basinward shift in the landward limit of shelf aggradation and a large reduction in shelf area. These changes imply a proportionately large basinward retreat of the early Oligocene paleoshoreline during chron 33 (34.4–32.6 Ma).

... (Note: The full version of this extended abstract, including complete text, illustrations, and references, will be made available at a later date on both the 2014 GCAGS convention website [www.gcags2014.com] and AAPG Search and Discovery website [www.searchanddiscovery.com]).