The Early Cretaceous Transition from Carbonate to Siliciclastic Deposition in the Deep Waters of the Northern Gulf of Mexico: New Insights from the Keathley Canyon 102 #1 Well

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Abstract

The Early Cretaceous in the northern Gulf of Mexico was a time of widespread carbonate deposition. The catchment area of clastic sediment directed into the Gulf of Mexico was relatively small. Moreover, a rimming carbonate margin prevented the movement of any significant volume of siliciclastic sediment, especially sand, into deep water. This depositional system changed dramatically, but briefly, in the Albian and Cenomanian with a shift to siliciclastic deposition recorded by the Tuscaloosa Group. The latest Cretaceous marked a return to carbonate deposition in the Navarro-Taylor supersequence up to the time of the Chicxulub Impact.

In this paper, we investigate a phase of clastic deep-water deposition during the Cretaceous with a new biostratigraphic age model integrated with core sedimentology and well log correlation, for the deep-water siliciclastic rocks encountered in the Keathley Canyon (KC) 102 #1 (Tiber) well. These data suggest that the transition to siliciclastic deposition in deep water began in the Albian, earlier than previously thought. Our new age model shows that a large part of the 1650 ft thick section of deep-water siliciclastic rocks encountered in the Tiber well are Albian and associated with the Paluxy-Washita (PW) supersequence, not Cenomanian-Turonian Eagle Ford–Tuscaloosa (EFT) supersequence as previously thought. Furthermore, the sandstones seen in core from the PW and EFT supersequences are relatively coarse-grained as compared to other Cenozoic reservoirs ranging from fine sand to coarse sand and granules. A thick section of deep-water sandstone in this grain size range hundreds of miles from the contemporaneous shoreline suggests a direct connection between updip fluvial deltaic systems and submarine canyons routing sand into submarine fans.

Geochemical data identifies organically enriched shales above the sand-rich siliciclastic interval seen in the KC 102 #1 well, which we interpret as evidence for the Coniacian-Santonian Oceanic Anoxic Event (OAE) 3.

The occurrence of thick, sand-rich, deep-water deposits in the Albian is important for two reasons. First, it has significant implications for unraveling the paleogeography of North America in the Cretaceous, especially the orientation of fluvial drainage systems that fed these submarine fans. Secondly, Cretaceous deep-water reservoirs are an emerging play in the central Gulf of Mexico, as demonstrated in recent drilling campaigns. Understanding reservoir distribution is key to the success of this new play. Moreover, potential source rocks in the Cenomanian and Coniacian overlie these reservoirs in an optimal position to both charge and seal reservoir sandstone.

Ed. Note: This abstract was extracted from a full paper published in the 2022 volume of the *GCAGS Journal*. The *Journal* papers are currently available in open-access format online at www.gcags.org.