Outcrop to Subsurface Chronostratigraphic Correlation of the Cenomanian to Turonian Organic-Rich Mudstone of the Eagle Ford Group

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Abstract

The Cenomanian to Turonian Eagle Ford Group outcrop at Lozier Canyon and along Highway 90 in west Texas provide excellent outcrop exposures that act as a natural laboratory to study organic-rich mudstone. However, detailed chronostratigraphic correlation linking outcrop units to subsurface oil- and gas-producing wells is lacking. In this study, zircons from nine bentonite beds from two outcrops in west Texas and two oil- and gas-producing wells in south Texas (McMullen and Karnes County) were analyzed for 206Pb/238U and 207Pb/235U isotope ratios using isotope dilution thermal ionization mass spectrometry (ID-TIMS) method. The U-Pb zircon ages were integrated with biostratigraphy, chemostratigraphy, sedimentology and thin section petrography to establish a comprehensive outcrop to subsurface correlation for the Eagle Ford Group. The 206Pb/238U ages range from 96.98 ± 0.1 Ma at the base of the Eagle Ford Group in west Texas to 88.9 ± 0.12 Ma at the Eagle Ford Group/Austin Chalk contact in Karnes County. Based on this age range, the Eagle Ford depositional environment is sub-divided into four distinct time intervals: Early - Middle (E-M) Cenomanian, Middle - Late (M-L) Cenomanian, Latest Cenomanian - Early (E) Turonian, and M-L Turonian. The E-M Cenomanian interval coincides with the deposition of storm-influenced interbedded skeletal packstone/grainstone (PS/GS) beds containing abundant hummocky cross-stratification (HCS) up-dip, passing down-dip into argillaceous, siliceous calcareous mudstone interbedded with

skeletal wackestone/packstone. The M-L Cenomanian interval records widespread deposition of organic-rich, calcareous mudstone interbedded with skeletal PS/GS beds. The Latest Cenomanian - E Turonian interval coincides with the deposition of pelagic calcareous mudstone in both the up-dip and down-dip sections. Thin-sections from a Karnes County well show abundant phosphate skeletal debris consistent with a submarine erosion surface in this interval. Biostratigraphy and carbon stable isotope data from the same well in Karnes County indicate that the Latest Cenomanian interval is not present in this well. The M - L Turonian interval coincides with the deposition of storm-influenced interbedded skeletal PS/GS in both the up-dip and down-dip sections. U-Pb age dates and biostratigraphy indicate a persistent regional submarine hiatal surface at or near the Turonian - Coniacian boundary in both outcrop and cores.