CARBONATE FACTORY RECOVERY FOLLOWING OCEANIC ANOXIC EVENTS: A CLOSER LOOK AT THE COW CREEK MEMBER OF THE PEARSALL FORMATION IN CENTRAL TEXAS

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ABSTRACT

Ocean anoxic events (OAEs) are major carbon cycle perturbations that occurred several times in the Mesozoic. These events are most associated with the suppression of precursor benthic carbonate factories, followed by the deposition of stressed carbonate facies and organic-rich mudstones. Major remaining questions regarding the OAE events is the degree of variability in impact and the drivers for this variability.

This work builds upon previous work and investigates the Early Cretaceous (Aptian) OAE-1a signal that is recorded in the Pearsall Formation in Central Texas, with a particular focus on the record of carbonate factory recovery preserved in the Cow Creek member observed in transects from the San Marcos Arch to the Pearsall Arch. Shoreline-proximal data include outcrops and 8 cores with 1530 ft of coverage. Distal cores include 7 subsurface exploration wells (total 1745 ft core) from the San Marcos Arch to the Pearsall Arch. Detailed facies descriptions and pXRF trace and major characterization show broad patterns of facies partitioning with water depth. Shallow water Cow Creek deposition is characterized by oyster and mollusk packstones to grainstones, and off-structure deposition is characterized by oyster-oncoid packstones to rudstones. This linkage of distal and shallow water carbonate factories demonstrates a complex record of evolving surface and bottom water conditions across OAE-1a, whereby the distal OAE-1a signal is tightly constrained by the *nannoconid* crisis event, and a $\delta^{13}C$ excursion, and identification of the shallow water OAE signal is constrained by $\delta^{13}C$ excursions and supported by pXRF comparisons to distal wells, which show increased surface water productivity and reducing bottom water conditions.

This earliest phase of carbonate recovery is similar on the San Marcos Arch and Pearsall Arch, but during later stages of recovery the Cow Creek on the Pearsall Arch is shown to have maintained healthier carbonate deposition in comparison with the San Marcos Arch, including the sustained deposition of reefal assemblages, such as the sequence of *stromatoporoid* boundstone present in the Tenneco Sirianni well. This core and outcrop framework demonstrates the superimposed regional variability inherent even in global carbon cycle perturbations such as OAE-1a.

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