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**Integrating Carbonate Process Sedimentology, Diagenesis and Subsurface Seismic Imaging: Lower Permian (Hueco Group), West Texas**

The Hueco Group offers an opportunity to understand the different sedimentological and diagenetic processes involved in the construction and evolution of carbonate platforms during icehouse periods. These platforms show an internal complexity that can be deciphered only after establishing a detailed process sedimentological analysis and a high-resolution sequence stratigraphic correlation. An improved geologic framework allows for field and GPR visualization of architectural elements and facies. In this study we investigate the seismic expression of the geologic features observed in outcrop by the means of petrography, density and P-wave velocity from core plugs, sonic, density, and gamma-ray logs from the Midland Basin, 1D/2D synthetic sections from outcrops and subsurface and finally a 3D seismic volume from the Midland Basin.

Preliminary results indicate that primary depositional bedding, texture, composition and diagenesis determine the acoustic properties associated to specific lithofacies; the diagenetic history of each lithofacies is controlled by its original grain size and allochem composition. Some of the observed field stratigraphic features, such as prograding clinosets, bed terminations, and unconformities lack observable reflectivity in areas of low impedance contrast. This can be partially explained by recurrent subaerial exposure of the platforms during sea level falls where meteoric diagenesis obliterated existing impedance boundaries via mineralogical stabilization and porosity occlusion. Understanding these phenomena is fundamental to narrow the gap between outcrop observations and reflection seismic.