

Seismic Geomorphology, Sequence Stratigraphy and Application of Self Organizing Maps for Identification of Architectural Elements: A Case Study of the Cenozoic Deep-Water Strata in the North Carnarvon Basin, Australia

Laura Ortiz Sanguino, Jerson Tellez, Heather Bedle
University of Oklahoma

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Abstract

A seismic-constrained stratigraphic characterization of Cenozoic deep-water strata in the North Carnarvon Basin is presented to define a sequence stratigraphic framework and assess a detailed description of the deep-water architectural elements integrating 3D seismic data, well log interpretation and biostratigraphic reports. We evaluate the use of geometrical seismic attributes to recognize the characteristics of architectural elements related to seismic facies at big scale. Furthermore, we use Self-Organize-Maps (SOM) to produce a geologically constrained interpretation of seismic facies using the most sensitive seismic attributes that help with the identification of deepwater architectural elements. Architectural elements deposition is linked to changes in sediment supply and accommodation space that can be explained in a sequence stratigraphic framework. We interpreted five second-order sequences and characterize the architectural elements within the system. The falling stage system tract is characterized by initial development of mass transport deposits due to failure of the outer shelf but deposited in the basin floor as well as small erosive channels in the upper slope and sand fan lobes on the lower slope. The lowstand system tract is related to the deposition of sand lobes on the basin floor. In contrast, the transgressive system tract exhibits isolated carbonate

build ups related to a rise in the sea level. The highstand system tract is associated to features like mass transport deposits and progradational sequences. The architectural elements (1) erosive channel-fills, (2) mass transport deposits and (3) lobe deposits were characterized according to their position on the slope, their dimensions and spatial relationships within the sequence. This seismic interpretation was verified with the well data for further detail.