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Henry W. Posamentier¹, Conor Byrne¹, Juan Pablo Collazos², Nelda Haraldson-Radford¹, Christina Johnson¹, Dan Krentz¹, Reg McLaughlin¹, Mike Miller¹, Marlene Mitchelmore¹, Mark Schoomaker¹ (1) Anadarko Canada Corporation, Calgary, AB (2) Anadarko Canada Corporation

Analysis of Depositional Systems Based on Seismic Geomorphology and Stratigraphy Integrated with Borehole Data: Case Studies from the Western Canadian Sedimentary Basin

Seismic geomorphology based on analysis of plan view images derived from 3D seismic data integrated with 2D images and borehole data comprises a powerful tool in the analysis of depositional systems and basin fill history. Case studies from both clastic and carbonate systems will be shown to illustrate this approach; work flows and exploration/development significance will be emphasized.

The recommended workflow involves 1) interpretation of key seismic horizons at or near the interval of interest, 2) performing stratigraphic reconnaissance of key intervals using flattened time slices, 3) identification of potentially significant geologic patterns on plan view (i.e., slice) images, 4) evaluation of these features using 2D sections to confirm stratigraphic origin of such features (i.e., elimination of those associated with data artifacts or structuring), 5) calibration of geologically significant features with borehole data, 6) analysis of various seismic attributes to further evaluate geological significant features, 7) display of key horizons in three dimensions draped with specific attributes.

Case studies include Cretaceous Mannville Group channels, Paleozoic reefs and channels, base Cretaceous incised valleys, and metamorphic basement from the Western Canadian Sedimentary Basin. These features were first identified through reconnaissance 'slicing' and later were examined in greater detail and calibrated using borehole data. In addition to the evaluation of a variety of seismic attribute displays, key isopach (isochron) maps can prove insightful. Isopach maps based on thickness between key horizons and underlying/overlying stratigraphic markers produce 'mold' maps, which can highlight regional thickening and thus subtle tectonic activity in addition to providing insight with regard to morphology at the horizon of interest.