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Predictive Stratigraphic Mapping of Thick Triassic Doig Sandstones in BC and Alberta

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A sequence stratigraphic model is proposed to describe the regional deposition of the thick Triassic Doig sandstones in northwest Alberta and northeast British Columbia, south of the Peace River Embayment (Townships 68 to 80, Ranges 11 to 25 W6 including parts of NTS 93-P). Logs, cuttings and about 50 cores from over 1700 wells were used with seismic to determine depositional facies and regional distribution of the Doig. The 20 to 80m thick Doig sandstones (sensu Wittenburg, 1992) occur within complex Halfway and Doig clinoforming packages. Mapping of several north-south striking clinoforms indicates that the thick Doig sandstones occur as isolated north-south oriented lens-shaped bodies. The growth-faulted thickened Doig sandstones are interpreted from core examination to be deltaic and shoreface facies deposited along accommodation driven shelf margins during forced regressions. Downdip, laterally equivalent slow velocity shales on logs and seismic are interpreted to be associated with slumped muds in front of the aggraded sandstones. The overlying Halfway sandstones are interpreted to comprise highstand systems tract in the clinoforming packages.

Isopach maps from well data were integrated into the regional sequence stratigraphic interpretation. As accommodation spaces were filled, the depositional systems would shift around the less compacted thick Doig sandstone bodies. Lobe switching is also interpreted at a local scale within individual aggradational sandstone bodies as the sedimentation adjusted to the changing accommodation space.

The interpretation of repeated shelf failure across the basin suggests autocyclic processes were involved. In contrast to the continuous Halfway sandstones, the discontinuous nature of the thick Doig sandstones does not support a robust supply system. Review of isopach, isochron, structure and structural residual maps indicates the Doig shelf margin failures could be associated with forced regressions during small eustatic sea level changes. The deposition of thick Doig sandstones does not correspond directly to underlying tectonic elements. Subtle irregular Montney and Lower Doig paleotopography probably controlled the distribution of accommodation space. Relative sea level changes resulted in sandstone aggradation and autocyclic failure of the underlying weak prodelta muds. The proposed model suggests that the Doig formation can have composite facies with diachronous highstand, forced regression, lowstand and minor transgressive system tracts along strike.

Reference

Wittenburg, J., 1992, Origin and Stratigraphic Significance of Anomalously Thick Sandstone Trends in the Middle Triassic Doig Formation of West – Central Alberta. Unpublished Master of Science Thesis, University of Alberta, Edmonton, 290p.