Sequence Boundaries in Cores: Examples from the Doig and Halfway Formations, WCSB

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ABSTRACT

Deposited during a period of tectonic, climatic and sedimentologic transition, the Middle Triassic Doig and Halfway formations in the WCSB host a significant amount of hydrocarbons. However, the formations have been relatively under-explored due to difficulties in stratigraphic correlation caused by displacement and/or disruption of sedimentary packages by local tectonics that create problems in reservoir prediction. This presentation, as part of an ongoing study, focuses on some of these issues as well as reporting on a previously unrecognized carbonate unit, using well-logs, conodont biostratigraphy, and detailed core analysis.

An easily recognized 2nd order sequence boundary separates the Doig Formation from the underlying Montney Formation, but the internal stratigraphically significant surfaces are much more complex and difficult to identify. Thirteen sedimentary facies have been identified from the study area (Twp. 70-87 and west 6th meridian to Alberta/BC border) and grouped into 5 lithofacies associations: 1) offshore/shelf, 2) offshore transition, 3) shoreface, 4) estuarine, and 5) carbonate ramp. The presence of rare conodonts, ichnofaunal assemblages, evidence of subaerial exposure, along with a suite of other sedimentary features makes it possible to recognize at least 5 higher order sequence boundaries within the Doig-Halfway interval. Maps for lithofacies successions bounded by these surfaces have also been constructed that portray a progressive northwestward migration of the depocentre through time.

The carbonate unit is composed of slightly dolomitic stratified silty lime mudstone with minor amounts of bioturbation and rare bivalve and brachiopod molds. Relative abundance of the conodonts and the lack of shallow water sedimentary structures suggest that the unit was possibly deposited in an open marine platform/ramp environment below storm-weather wave base. The bounding unconformities bracketing the carbonate unit can be traced over long distances (~150km), to areas with markedly contrasting lithologies and depositional environment, suggesting that regional relative sea level fluctuations were responsible for the deposition of this unit during the Early Anisian.