Stacy Atchley[1], Mark McMurray[2] (1) Baylor University, Waco, TX (2) Advantage Energy Services, Ltd, Calgary, AB

Devonian (Frasnian) Leduc- and Nisku-Equivalent Outcrops near Canmore, Alberta: 1-D Outcrops as a Guide to Subsurface Stratal Architecture

Stratigraphic equivalents to the Devonian (Frasnian) Leduc and Nisku Formations crop out as continuous exposures near Canmore, Alberta, and illustrate the value of detailed one-dimensional rock description in predicting subsurface facies distributions. The outcrop succession is comprised of shallow marine carbonate facies that accumulated during an episode of composite accommodation change. Fifty-six meter- to decameter-scale depositional cycles are partitioned into three sequences that in turn stack into a deepening and shallowing set. Systematic changes in cycle thickness and facies proportions suggest that the lower and middle Leduc evolved from an initially aggradational to later retrogradational succession (i.e., cycles thicken and become increasingly dominated by outer shelf facies), whereas the upper Leduc and overlying Nisku accumulated as a progradational succession (i.e., cycles thin and become increasingly dominated by inner shelf facies). The upper Leduc and Nisku contain two sequence boundaries that are characterized by microkarst features, and abruptly separate subtidal-prone cycles (below) from intertidal-prone cycles (above). The exploration-scale stratal architecture observed within the subsurface of central and southern Alberta is consistent with the sequence stratigraphic interpretation derived from outcrop. Leduc buildups characteristically retrograde and 'drown' above antecedent paleotopographic highs, and are overlain by progradational Nisku (or equivalent) platform carbonates. At the production-scale, detailed core description demonstrates that reservoir flow units within 'drowned' Leduc buildups often coincide with depositional sequences. Reservoir-prone reef margin and reef flat facies are compartmentalized into discrete flow units due to retrogradational sequence stacking.