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Core to log correlation of Montney members and stratigraphic surfaces

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The Montney has recently been formally subdivided into eight regionally extensive Members on the basis of lithology, mineralogy and well log character (Figures 1 and 2; Zonneveld and Moslow, 2018). The main members (the Lower Montney Member, Middle Montney Member and Upper Montney member) occur throughout the basin, and their boundaries coincide with major stage boundaries (Dienerian-Smithian and Smithian-Spathian). The boundaries of these three lithostratigraphic subdivisions coincide with regionally extensive sequence bounding unconformities. These surfaces are generally easily picked on geophysical logs due to phosphate grain / heavy mineral lags that are deposited in association with erosional removal of the lighter fraction of the silt-dominated sediment as well as sharp facies shifts at member contacts as observed in full diameter cores. In fact, core to log calibrations make the regional correlation of sequence stratigraphic surfaces possible.

Carbonate -dominated units in the Montney Formation consist of the Pocketknife, Altares and Anten Coquina Members (Zonneveld and Moslow, 2018). Close analysis of PE and density logs allows for these units to be easily differentiated from bounding members. The Pocketknife Member, formerly referred to as the *Claraia* zone, consists of bituminous, planar-laminated siltstone with abundant thin-shelled bivalves and thin bioclastic packstone beds. It occurs interbedded with the Lower Montney Member. The Anten Coquina Member (formerly the informal coquinal dolomite middle member) occurs in the eastern part of the Montney basin (near the subcrop limit) and consists of bioclastic grainstone dominated by fragmentary, disarticulated bivalves, gastropods and lingulide brachiopods that occurs coincident with the Dienerian-Smithian boundary. The Altares Member consists of interbeds of bioclastic packstone and grainstone with bituminous dolomitic siltstone and occurs interbedded with the upper part of the Middle Montney Member in the west-central part of the basin.

Two sandstone-dominated members also occur. The Calais Sandstone Member occurs near the base of the Montney and consists of well-sorted cross-stratified fine-grained sandstone (Zonneveld and Moslow, 2018). The La Glace Sandstone Member occurs near the base of the Middle Montney Member (Zonneveld and Moslow, 2018). Both sandstone members occur primarily within the Peace River embayment (*sensu stricto*) area. Where it occurs right at the base of the Montney (i.e. without an intervening tongue of Lower Montney siltstone), the Calais Sandstone Member can be difficult to differentiate from the Belloy Member. In this case, close analysis of Neutron and Density logs helps in that the Calais Sandstone typically has much higher porosity than underlying Palaeozoic units.

Dominated by subangular to subrounded quartz silt and a low overall proportion of clay and high proportion of detrital dolomite and feldspar, the Montney is compositionally and texturally unique in Western Canada. Although fine-grained siliciclastic sediment dominates, dolomite occurs throughout the Montney Formation and several regionally extensive bioclastic packstone and grainstone horizons occur. Various evidences, including stratigraphic architecture, the presence of late Paleozoic and Mesozoic zircons and sediment geochemistry support the contention that the Montney is a product of deposition in a collisional retro- foreland basin setting (Beranek and Mortensen, 2007; Ferri and Zonneveld, 2008; Rohais et al., 2018; Zonneveld and Moslow, 2018). Montney deposition records a low-relief clastic ramp succession deposited in an arid coastal setting and includes units deposited in a variety of shallow marine and turbidite lobe / channel settings. The Montney's unique mineralogical and textural composition is a function of both the demise of Palaeozoic carbonate-secreting organisms and deposition in an arid coastal setting fed by rare perennial, and abundant ephemeral fluvial systems (Zonneveld and Moslow, 2018).

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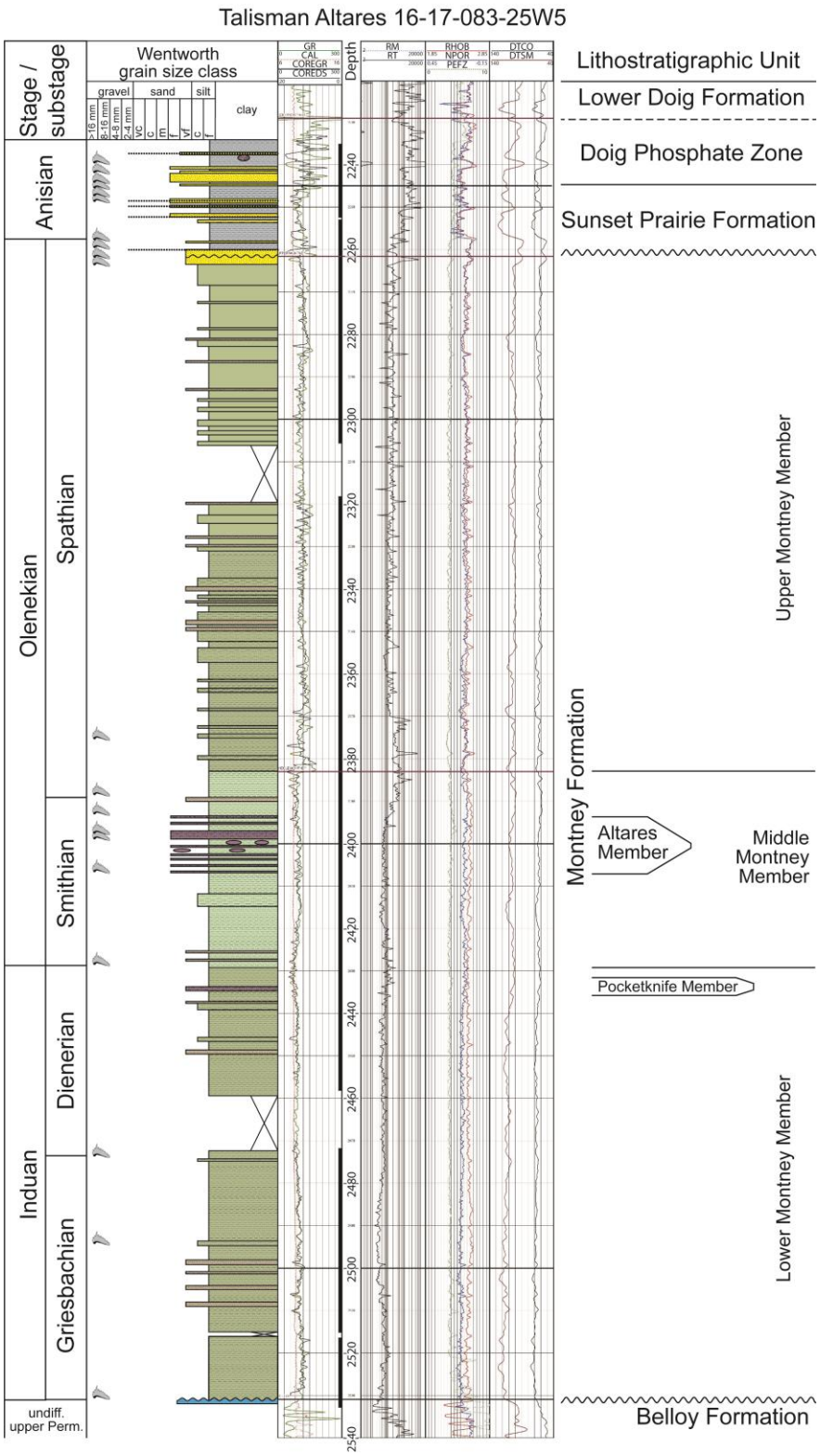

Figure 1. Gamma log and core description of the Montney reference section in Talisman Altares 16-17-83-25W6M, between 2257 and 2528 m.

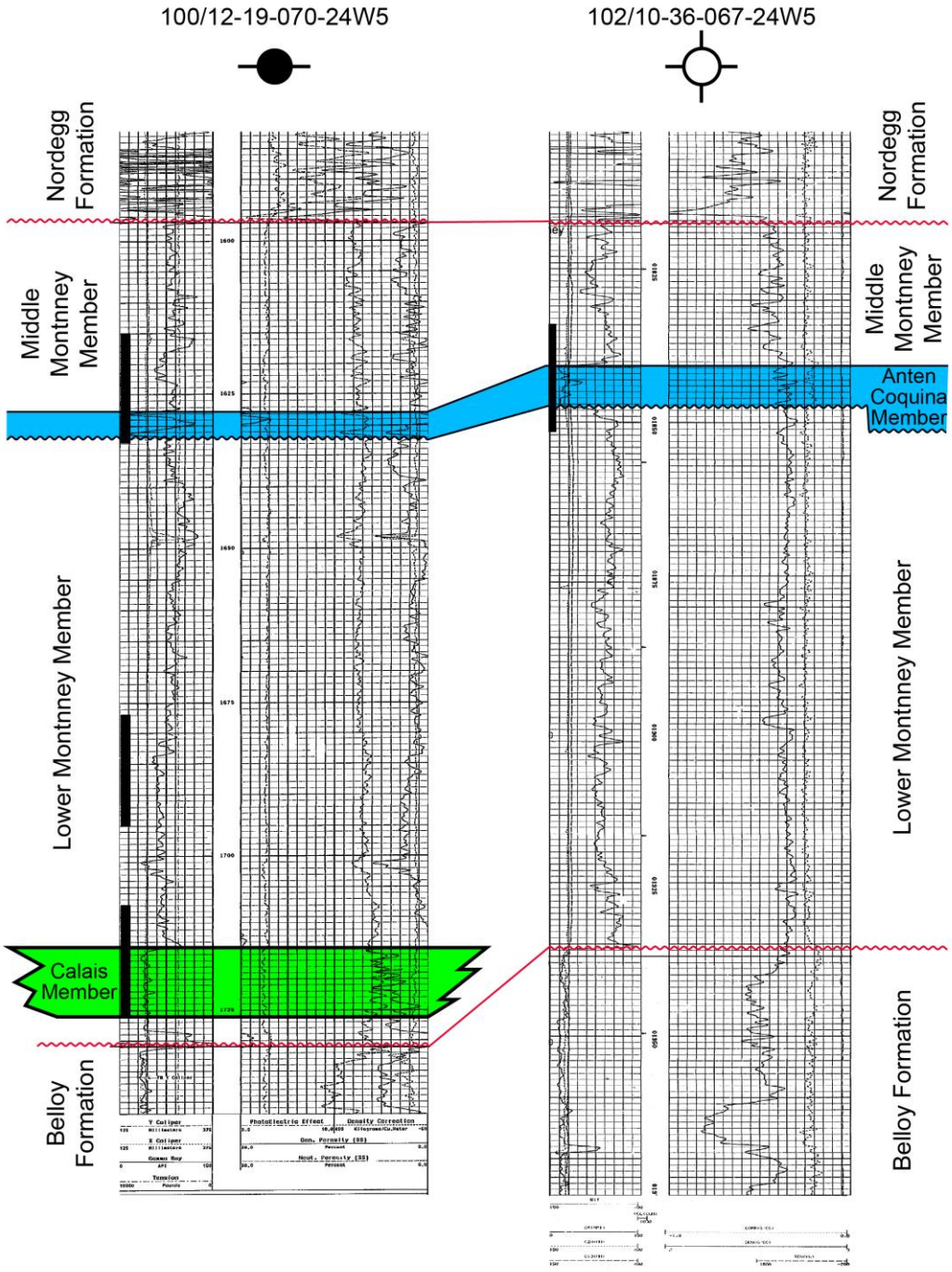

Figure 2. Well log correlation, T67-70 R24W5, central Alberta. Note greater thickness of the Lower Montney succession and the concomitant occurrence of the Calais Sandstone Member in the northwestern well as well as the thinning of the Anten Coquina Member between the two wells.