Datashare XXX Supplementary Material 2

Case Study: Frobisher-Alida Glenburn-A Flow Unit Southwest North Dakota

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Precursor sediments for Glenburn flow units formed in a fully open-marine environment (facies V of Petty,1988, 1996, 2010) in southwest North Dakota where deposition occurred approximately 200 km seaward from the Glenburn shoreline (Petty, 1996). Regionally, the Glenburn-A flow unit is sub-parallel with the overlying Fryburg gamma-ray marker bed and other adjacent flow units (Figure 1 S2). This flow unit is only productive where thick oil columns have built up and it is usually commingled vertically with overlying flow units (e.g., TR Field well in Figure 1 S2). Burrow-bioturbated, skeletal wackestone is the dominant lithology but bioturbated skeletal packstone occurs locally. Skeletal wackestone commonly consist of dolostone or calcareous dolostone. Rarely, porous dolomitic limestone (i.e., >50% calcite mineralogy) occurs in skeletal packstone in samples with minimal dissolution of fossil material (Figure 2A S2). Crinoid fragments, brachiopod fragments, bryozoan fragments and coral fragments are common fossil constituents. Significant amounts of fossil-moldic vuggy porosity (Figure 2B S2) are common in this facies, with amounts as high as 10% for individual samples (Datashare Supplementary Material 3). Intercrystal dolomite porosity occurs in a matrix with 16 µm average dolomite crystal size and regional porosity-permeability data displays a consistent relationship (Figure 2C S2).

References Cited

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Petty, D. M., 2010, Sequence stratigraphy and sequence boundary characteristics for upper Tournaisian (Mississippian) strata in the greater Williston Basin area: an analysis of a third-order cratonic carbonate-evaporite depositional cycle: Bulletin of Canadian Petroleum Geology, v. 58, p. 375–402.

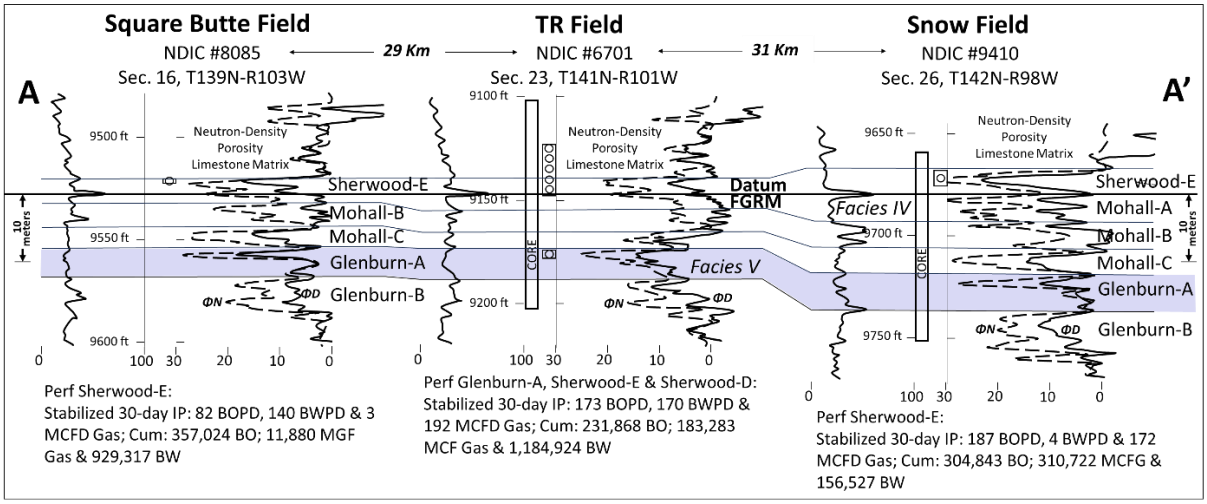

Figure 1 S2. Cross section A-A' for the Sherwood-E through Glenburn zones in southwest North Dakota. See Figure 9B in text for location of cross section.

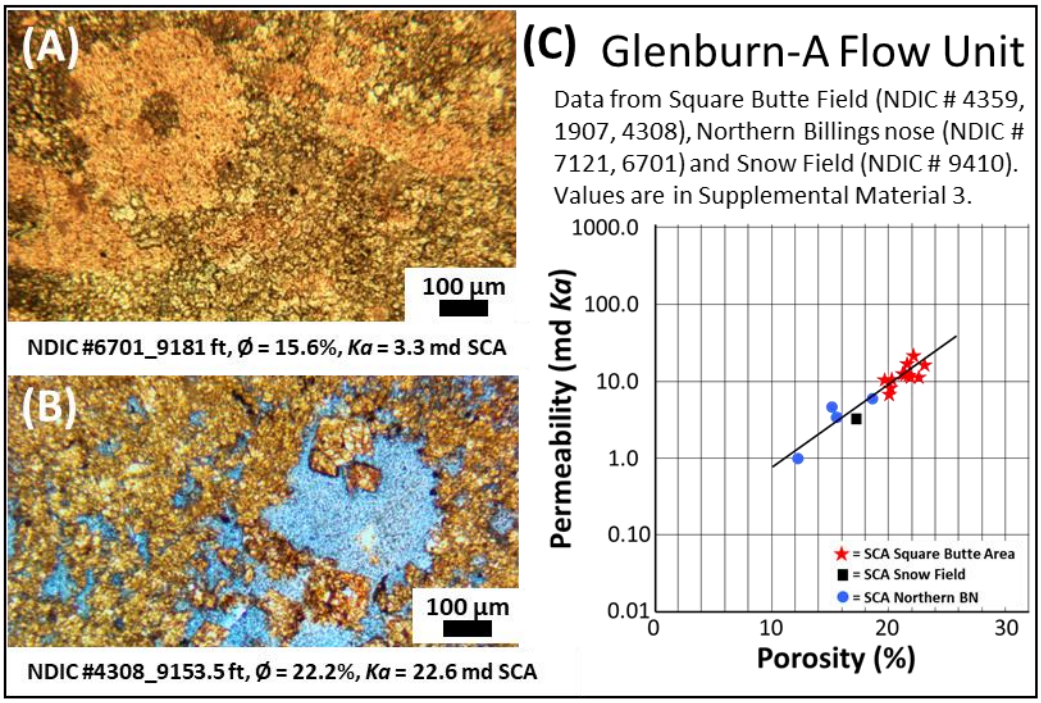

Figure 2 S2. A) Thin section micrograph showing Glenburn-A facies V skeletal packstone with calcite skeletal grains (stained red) in a porous dolomite matrix. B) Thin section micrograph showing Glenburn-A facies V skeletal wackestone with good fossil-moldic vuggy porosity. C) Porosity-permeability (*Ka*) crossplot for Glenburn-A flow unit in southwest North Dakota.