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Inclined Heterolithic Stratification Within Tidal Channel Deposits: A Subsurface Investigation of the Ellerslie Member, Lower Mannville Formation, St. Albert, AB, Canada

Sami Riahi* and Federico F. Krause
University of Calgary, Calgary, AB T2N 1 N4
sriahi@ucalgary.ca

ABSTRACT

In the St. Albert region of central Alberta, the Ellerslie Member displays tidal signatures that are present at multiple scales. Point bar deposits comprising decameter scale inclined heterolithically stratified (IHS) sandstones are present at the macroscale. Cross-bedded sandstone beds with extensive shale rip-up clast lags found at their bases typify these deposits. These IHS sandstones are compartmentalized by bounding decimeter scale inclined shale interbeds. Numerous meso- and microscale sedimentary structures are found within the IHS sandstone intervals and include flaser bedding, high-angle dune scale cross-bedding, and both mud and very fine sandstone doublets. These multi-scale structures collectively indicate tidal deposition.

Although deposited under similar conditions, as shown by matching sedimentary structures, analysis reveals petrological differences within the IHS sandstones. Initial observations denote the presence of two distinct channel fill sandstones that are distinguished on the basis of their lithic component. The lithic rich channels consist of poorly cemented, semi-consolidated, pebble-rich, and coarse-grained sandstone. In contrast, the lithic poor channel sandstones are consolidated, and very fine to fine grained.

Mapping of these channel sandstone deposits indicates that they belong within an 8 km wide paleoria that is oriented ENE – WSW. This paleoria also branches to the south where drilling activity has encountered hydrocarbon bearing IHS deposits that are currently on production. These include the prolific 00/6-1-54-26W4/2 well that has produced 19.5 Bcf from a 2.5 m pay zone, since 1998. Petrologic and depositional characteristics seen in these IHS deposits are similar to those found in the northern part of the same paleoria. The similarity in these responses suggests that exploration efforts in the currently under-developed study area could replicate this earlier success.