

# **Variable Discharge Signatures in a Large Fluvial Fan: Paleomorphodynamics Reconstruction and Stratigraphic Prediction of Sunnyside Delta Interval, Green River Formation (Eocene), the Southwest Uinta Basin, Utah**

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## **ABSTRACT**

This study investigates variable discharge signatures in the well exposed cliff face outcrop along the Nine Mile Canyon Road in Southwestern Utah. Whether fluctuating flow results in sediment deposition and preservation in fluvial systems has remained debated. Experiment studies and a few field examples in publications have shown that under high aggradation rate/deposition rate, unique bedforms can be formed and preserved in ancient records. It has also been proposed that rivers with extreme variable discharges promote the deposition of fluctuating flow sedimentary structures. The goal for this study is to document characteristics of variable discharge signatures present not only in bedform scale, but also in barform scale. Detailed quantitative field studies on the fluvial channel facies, geometries and architecture are conducted and whether or not they are influenced by Froude supercritical flow under high deposition rate. This work adds a significant contribution the current facies model of seasonal rivers. The results show that a total of six types of channel fills were identified. The first three types are characterized of high amounts of Froude supercritical flow and high deposition rate sedimentary structures, which show great lateral variability in outcrop, whereas cross stratifications or laminations are significantly lacking. Type 4, 5, and 6 has relatively lower proportion of Froude supercritical flow and high deposition rate sedimentary structures. In barform scale, slipface cross strata are not seen as much as low angle downstream accretions, highly amalgamated channel fills, and systematic upstream migrating bedforms. Incorporating channel fill amalgamation ratio, mud proportion, and the associate facies, the six channel fill types are also analyzed in the context of their lateral and stratigraphic position in a fluvial fan system, ranging from the axial to lateral/distal part of the fan, and to the fan toe. This study investigates variable discharge signatures in the well exposed cliff face outcrop along the Nine Mile Canyon Road in Southwestern Utah. Whether fluctuating flow results in sediment deposition and preservation in fluvial systems has remained debated. Experiment studies and a few field examples in publications have shown that under high aggradation rate/deposition rate, unique bedforms can be formed and preserved in ancient records. It has also been proposed that rivers with extreme variable discharges promote the deposition of fluctuating flow sedimentary structures. The goal for this study is to document characteristics of variable discharge signatures present not only in bedform scale, but also in barform scale. Detailed quantitative field studies on the fluvial channel facies, geometries and architecture are conducted and whether or not they are influenced by Froude supercritical flow under high deposition rate. This work adds a significant contribution the current facies model of seasonal rivers. The results show that a total of six types of channel fills were identified. The first three types are characterized of high amounts of Froude supercritical flow and high deposition rate sedimentary structures, which show great lateral variability in outcrop, whereas cross stratifications or laminations are significantly lacking. Type 4, 5, and 6 has relatively lower proportion of Froude supercritical flow and high deposition rate sedimentary structures. In barform scale, slipface cross strata are not seen as much as low angle downstream accretions, highly amalgamated channel fills, and systematic upstream migrating bedforms. Incorporating channel fill amalgamation ratio, mud

proportion, and the associate facies, the six channel fill types are also analyzed in the context of their lateral and stratigraphic position in a fluvial fan system, ranging from the axial to lateral/distal part of the fan, and to the fan toe.