Mississippian Sequence Stratigraphy in the Williston Basin

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The Mississippian System in the Williston Basin lends itself to sequence stratigraphic analysis. The basal Lodgepole Formation (Mississippian) contains open marine fauna and is marked by sea level rise which flooded the Bakken basin. This flooding event was the base of a high stand systems tract which prevailed, with one exception, from the Kinderhookian through the Meramecian.

The Lodgepole Formation contains thick progradational wedges of carbonate that formed clinoform morphologies. The toes of these clinoforms are dominated by shaley carbonates. There are multiple depositional cycles within the Lodgepole that were produced by variations in sea level and rates of progradation.

Mission Canyon and Charles deposition was marked by two sea level rise cycles and a pronounced, but subtle base level fall. The first sea level rise flooded the MC2 interval, and the second occurred at the base of the Midale (Charles Formation). Within the middle Mission Canyon interval, base level fall introduced siliciclastic detritus into the carbonate basin. The Kisbey Sandstone marks this base level fall and subsequent rise cycle.

During Charles deposition, a high stand systems tract was present and thick salts, associated with progradational paracycles, precipitated within the center of the Williston Basin.

The top of the Charles is marked by an unconformity and a base level fall. Terrigenous clastics of the Big Snowy Group (Chesterian) cap the Charles. Within the Big Snowy Group (Kibbey, Otter, and Heath formations), base level rise and fall cycles are present.