

Sedimentologic and Stratigraphic Investigation of Carboniferous Formations in Northern Utah and Central Montana: A Record of Late Paleozoic Climate Evolution, Eustasy and their Relation to Petroleum System Development

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ABSTRACT

The Late Paleozoic Ice Age (LPIA) was a ~76 myr period when ice centers waxed and waned during asynchronous glaciations across Gondwana resulting in complex glacio-eustatic sea-level oscillations. Despite efforts, understanding of LPIA initiation is not fully resolved. The Heath (MT) and Manning Canyon (UT) Fms are prospective unconventional hydrocarbon plays that preserve paleotropical cyclothem that broadly coincide with the late Mississippian onset of the LPIA. These units and younger strata permit refined records of LPIA onset, as well as Carboniferous sea-level and paleoclimate change. Sedimentologic analysis of Carboniferous strata in central Montana and northern Utah from this study inform an early Serpukhovian onset to the LPIA, new stratigraphic records of sea-level and paleoclimate variations, as well as new depositional models for the Heath and Manning Canyon Fms. Carbonate isotope and chemical indexes of weathering (CIWs) from marine and paleosol facies are needed to better assess low latitude paleoclimate patterns and their relation to LPIA glacial dynamics. Stratigraphic and geochemical records from this study will provide new insight into the controls that the scale and frequency of LPIA eustatic oscillations exerted on the formation of Carboniferous petroleum systems, including reservoir connectivity and climate-driven eogenetic influences on porosity. These results will provide data from which the effects of climate and sea-level oscillations on reservoir quality in mixed carbonate-siliciclastic successions can be potentially assessed and applied to future exploration efforts.