

## Paleocaves in Mississippian carbonates: surface and subsurface examples

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The recent application of horizontal drilling to fractured and leached carbonates along subcrop edges of Mississippian formations in western Canada has revealed locally complex reservoir geometry. Amongst the various discontinuities within potential reservoir host rocks are paleocaves, many of which are filled with sandstone and shale that provide tortuous permeability barriers.

Paleocaves exposed in outcrops in Montana show several features common to paleocave systems. Roof collapse is expressed as conical steeply-dipping breccia piles, as well as fracturing and sag of overlying strata into the former cavern. Infiltrated siliciclastics fill tortuous branching and side passages and are interbedded with breccia.

The presence of paleocaves along the Pekisko subcrop edge in the Alberta is inferred from log signatures which indicate the anomalous presence of siliciclastic successions within Mississippian formations. Paleocaves range from decimetre-scale sandstone and shale-filled solution cavities and fractures to caverns up to 30 metres high. Above larger caverns, roof sag has caused thickening of overlying formations where sedimentation was concentrated in low-lying areas.

Wall rock in the vicinity of caverns has been subject to penetration by numerous smaller side passages which can be recognized from gamma logs where filled with siliciclastics. In addition, reduction of the host formation by intraformational solution may have occurred. The result is serrated gamma log signatures and anomalous thin formations.

Lithologic control on the formation of caves is suggested where they follow stratigraphic discontinuities. For example, along the contact between porous dolostone and tight limestone facies exposed at the subcrop edge. Caves formed where rainwater was able to preferentially access the formation through porous facies. Fractures probably provided the same function but their orientation is difficult to infer from old logs and unoriented core in the subsurface.