

ABSTRACT
SPELEO BRAZIL 2001
Brasília DF, 15-22 de julho de 2001

13th International Congress of Speleology
4th Speleological Congress of Latin América and Caribbean
26th Brazilian Congress of Speleology

Karst Geomorphology and Hydrology of the Bear Rock Formation: A dissolutional megabreccia in the continuous permafrost zone of the Northwest Territories of Canada

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The Bear Rock Formation (Devonian) underlies >50,000 km² of the Mackenzie Valley and Mountains around 66°N. Where it is overlain by later strata coring reveals 250-300 m of dolostone and anhydrite, a typical sabkha facies. In outcrop this is reduced to a calcite-cemented megabreccia, 120-140 m in thickness, created by meteoric groundwaters. Mean annual temperatures range -7 to -9°C today, supporting continuous permafrost averaging 50 m in depth.

Karst landforms develop in the breccia on all outcrops. Principal types are collapse and subsidence dolines, blind valleys, subsidence troughs and small poljes along the zero sub-edge of the Formation, and stream caves blocked by detritus or ice. Together they form striking dissolution drape landscapes. Periglacial processes attack all features, partially filling them with talus or solifluction lobes. Field studies during three melt seasons established that there is effective underground circulation of sinking allogenic waters despite the permafrost. Modelling indicates that there are three-component circulation systems involving the Bear Rock Fm plus underlying dolostone and salt, extending the brecciation process at depth today.