



Rocks, Organics, Strength, Relief – Behind the Scenic Banff Formation Outcrops

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Introduction

The Lower Carboniferous Banff Formation of Western Canada Sedimentary Basin (WCSB) is a widespread and up to 800 m thick succession deposited on the cratonic platform in the northwestern margin of ancestral North America. The Banff Formation is well exposed in the Front Ranges of the Canadian Rockies. Repeated stratigraphy, caused by Mesozoic thin-skinned thrusting, allows for examination of sections representing proximal to distal depositional settings over relatively short distances along an east–west transect. In outcrops, the Banff Formation is easily recognizable by its distinct beige to light brown, weathered color. The Banff Formation forms relatively gentle slopes compared to the underlying dark grey, cliff-forming Palliser Formation and overlying light grey Rundle Group. Increased shale and/or silt content are commonly invoked to explain enhanced erosion of the Banff Formation.

Theory

Multidisciplinary data analysis includes slope measurements using Digital Elevation Models (DEM) and ArcMap Spatial Analytics tools, as well as a number of analysis of selected outcrop samples from Canyon Creek and Lac des Arcs including: RockEval, Gas Chromatography – Mass-Spectrometry (GCMS), Raman Spectrometry, Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD), X-ray Fluorescence (XRF), and nano-scale geomechanics.

Examples

Results integrated and interpreted in contexts of sedimentology and geomorphology suggests the strong impact of various lithologies and dispersed organic matter on differential erodibility of Banff Formation outcrops.

Conclusions

Rock composition coupled by presence of organic matter and bitumen strongly controls geomechanical properties and associated enhanced weathering of the Banff Formation.

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