



# Geological and Petrological Characteristics of the Ren Carbonatite, Southeastern British Columbia

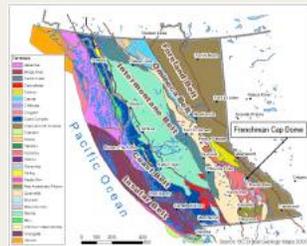


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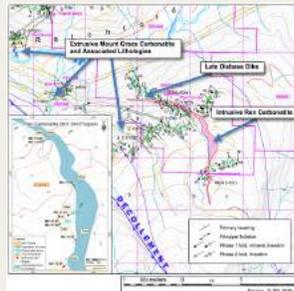
## Geology and Geochronology

Carbonatites are relatively rare magmatic rocks that consist of more than 50% carbonate minerals, and are enriched in rare earth elements (REEs), high field strength elements (HFSEs) and phosphorus. Their global occurrence is generally limited to continental rifts, and their origin has been the focus of an ongoing debate among petrologists.

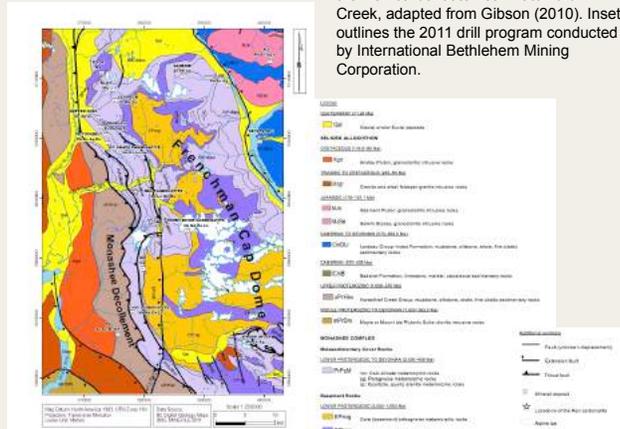
The Ren carbonatite occurs in the Monashee Complex, along the northwestern margin of Frenchman Cap (gneiss) Dome, within the calc-silicate unit. It has intrusion age of ~700 Ma (Millonig et al., 2012) and was affected by amphibolite-facies metamorphism at ~50 Ma, with virtual resetting of the U-Pb isotopic system of magmatic pyrochlore (Millonig et al., in press). The carbonatite unit near Ratchford Creek is 3 km long and 20–150 m wide. It is variably enriched in REEs and HFSEs at generally low-to-medium grades. The Ren carbonatite appears to comprise additional but discontinuous carbonatite segments, with similar stratigraphic relationships, several km to the south. This carbonatite occurrence therefore encompasses a total large unknown tonnage of mostly unknown REE and HFSE grades, which warrants considerable exploration.



Tectonic belts and geological terranes of British Columbia. The Ren carbonatite occurs in the Frenchman Cap Dome of the Monashee Complex, within the Omineca belt.



Local geological features associated with the Ren carbonatite near Ratchford Creek, adapted from Gibson (2010). Inset outlines the 2011 drill program conducted by International Bethlehem Mining Corporation.



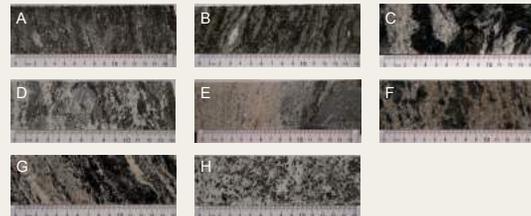
Regional geology and mineral deposits of the Frenchman Cap Dome area.

## Field Observations

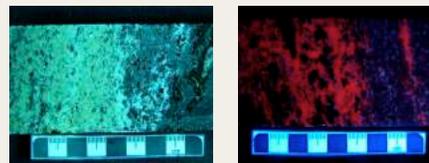


Images of the Ren carbonatite in the field. (A) Discordant contact of dolomite-calcite silicocarbonatite (buff) with ribbons of biotitic pyroxene-amphibole fenite (dark) and xenoliths of calc-silicate gneiss (white). (B) Boudinage structure of discordant gneiss xenolith with an S-shaped fold. (C) Layered dol-cal silicocarbonatite with screens of biotitic pyroxene-amphibole fenite. (D) A twenty-metre wide section of exposed dol-cal silicocarbonatite with thin lenses of fenite. (E) Dol-cal silicocarbonatite with ribbons of fenite and assimilated gneiss displaying erratic flow patterns and folds. (F) Core of niobium-rich dol-cal silicocarbonatite with dark concentric bands of primarily biotite, magnetite and ilmenite delineating a fold closure. (Pictures C & F courtesy of Gordon Gibson.)

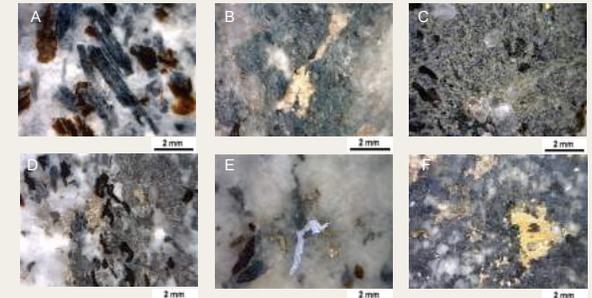
## Lithology, Petrology and Mineralogy



Lithological variations apparent within the Ren carbonatite. (A) Banded biotite-rich fenite with minor carbonatite. (B) Banded pyroxene-amphibole fenite with minor carbonatite. (C) Partially assimilated calc-silicate gneiss with fenite and carbonatite lattices. (D) Calcite silicocarbonatite with embedded calc-silicate xenoliths. (E) Schistous dol-cal silicocarbonatite with remnant xenoliths. (F) Xenolith-free, schistous dol-cal silicocarbonatite. (G) Gneissic dol-cal silicocarbonatite. (H) Massive calcite silicocarbonatite.



UV Images of Ren carbonatite. Left: Shortwave UV light showing grains of monazite (bright green). Right: Longwave UV light showing grains of fluorapatite (lavender) over calcite (bright red) and bands of dolomite (dark).



Mineralogical characteristics of the Ren carbonatite. (A) Riebeckite (blue), phlogopite (brown) and carbonates (white). (B) Titanite (yellow) surrounded by riebeckite (blue) and albite (white-grey). (C) Apatite (clear) and phlogopite (dark brown) with clinopyroxene (blue-green) in the background. (D) Magnetite and ilmenite (metallic grey), titanite (reddish brown), pyrrhotite (yellow-bronze), phlogopite (dark), carbonates (white). (E) Molybdenite (shiny grey), pyrrhotite (yellow-bronze), riebeckite (blue), phlogopite (dark brown), with albite (white-grey) and carbonates (white) in the background. (F) Skeletal chalcocopyrite (shiny yellow) and pyrrhotite (yellow-bronze), with riebeckite (blue) and carbonates (white) in the background.

## Research Techniques

The research techniques used to study the petrology and origin of the Ren carbonatite include:

1. Optical petrography and mineralogy to obtain a detailed description of mineral assemblages, abundances and textures.
2. SEM and microprobe analyses to examine the chemistry of major and accessory phases.
3. Potential isotopic studies to better understand the origin of the carbonatite and its mineralization.

## References

Gibson, G. (2010) Geological and Geochemical Report on the Myoff Creek Property. Kamloops Mining Division, B.C. Assessment Report, dated September 15, 2010.  
Millonig, L.J., Gerdes, A. & Groat L.A. (2012) U–Th–Pb geochronology of meta-carbonatites and meta-alkaline rocks in the southern Canadian Cordillera: A geodynamic perspective. *Lithos*, 152, 202–217.  
Millonig, L.J., Gerdes, A. & Groat L.A. (in press) The effect of amphibolite facies metamorphism on the U–Th–Pb geochronology of accessory minerals from meta-carbonatites and associated meta-alkaline rocks. *Chemical Geology*, xxx, xxx–xxx.

## Acknowledgments

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Poster created by Avee Ya'acoby, M.Sc. candidate, January 2013.