CARBONATITES AND ALKALINE ROCKS IN THE SOUTHERN CANADIAN CORDILLERA
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SCOPE AND GEOLOGICAL SETTING
In British Columbia (B.C.) carbonatites, nepheline and sodalite syenite gneisses and related alkaline rocks are found in a zone which is parallel to, and on either side of the Rocky Mountain Trench. From the 14 known carbonatite occurrences in B.C. (Fig. 1) 7 have been dated with reported intrusion ages between 356 Ma (Ice River Complex) and 202 Ma (Howard Creek). Associated syenite complexes are either ~coeval (Trident Mountain) or significantly older (Mount Copeland Syenite). However, most of the intrusion ages cluster around Mississippian time. Subsequently all carbonatites and alkaline rocks were affected by (multiple?) greenschist to amphibolitefacies metamorphism. The scope of this study is to provide reliable age data through LA-ICP-MS U-Pb age dating of zircons of previously undated and/or unknown carbonatites and accompanying alkaline rocks in British Columbia in order to better understand the mineralogical and chemical differences between the individual magmatic bodies and the geodynamic setting during their emplacement. 10 carbonatite, 2 mafic and 4 syenite samples are currently being processed in this study.

How old are the undated carbonatites/alkaline rocks?
Is the spread in interpreted intrusion ages (202-356 Ma) real?

GEODYNAMIC BACKGROUND
Miogeoclinal sediments of the Windermere Supergroup were deposited during the initial break-up of Rodinia in the Neoproterozoic at <750 Ma (Fig. 2).
Final separation of Siberia and Laurentia occurred during the Early Cambrian at ~540 Ma and during the Middle Devonian the passive continental margin of western Laurentia became an active margin (Fig. 3).
Extensional tectonics in the Early Carboniferous lead to back-arc basin formation at ~355-320 Ma (Fig. 3).

FIG. 1:
a) Carbonatites (black) and associated alkaline rocks (blue) in B.C. with their interpreted intrusion ages (modified after Woolley & Kjarsgaard, 2008).
b) Distribution of miogeoclinal sediments in B.C. in which the carbonatite and alkaline rocks intruded (Lund et al., 2010).


FIG. 3: Geodynamic evolution of the western margin of Laurentia during Early Paleozoic to Permian time (modified after Monger, 2008).
Carbonatites in the Blue River area (Fig. 4) are numerous and widely dispersed with interpreted intrusion ages between 202 Ma (Howard Creek) and 351 Ma (Paradise Lake).

In the Perry River Area (Fig. 5) carbonatites and alkaline rocks intruded the mantling gneiss succession of the Frenchman Cap Dome and are either of Cryogenian age (Mount Copeland syenite) or Cambrian age (Mount Grace carbonatite) based on stratigraphic relationships.

**Serpentine Creek carbonatite – Blue River Area**

**FIG 6.:** Zircons from the Serpentine Creek carbonatite. a) Image of euhedral transparent short prismatic zircons. b+c) CL - images of the zircons revealing oscillatory magmatic zoning in some cores and alteration/zircon growth along the rims.

**Little Chicago carbonatite – Blue River Area**

**FIG 8.:** Zircons from the Little Chicago carbonatite. a) Image of euhedral transparent to yellow short prismatic zircons. b+c) CL - images of the zircons revealing oscillatory magmatic zoning in some cores and various forms and degrees of alteration and/or zircon growth.

**FIG 7.:** Concordia diagram of U-Pb zircon analyses from the Serpentine Creek carbonatite with an interpreted intrusion age of ~340 Ma and Pb-loss during a metamorphic overprint at ~80 Ma.

**FIG 9.:** Concordia diagram of U-Pb zircon analyses from the Little Chicago carbonatite with an interpreted intrusion age of ~490 Ma and Pb-loss during metamorphism at ~156 Ma.
Perry River syenite

FIG 10: Zircons from the Perry River syenite. a) Image of euhedral slightly elongated prismatic zircons. b+c) CL-images of the zircons revealing oscillatory magmatic zoning and different degrees of alteration in some cores as well as alteration/zircon growth along the rims. d) Concordia diagram of U-Pb zircon analyses from the Perry River syenite with an interpreted intrusion age of ~800 Ma and Pb-loss during a metamorphic overprint at ~50 Ma.

RESULTS AND DISCUSSION

- The Serpentine Creek carbonatite was emplaced during extensional tectonics in Mississipian times at 340 Ma.
- The intrusion of the Little Chicago carbonatite at 489 Ma is interpreted to be related to the separation of Laurentia and Siberia. No carbonatites of comparable age have been documented in the Canadian Cordillera yet, but are known from the Cordillera in the USA!
- The Perry River syenite is interpreted to be part of the Mount Copeland syenite and intruded during the initial stages of the break-up of Rodinia at ~800 Ma.

REFERENCES


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