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Insights into the age and composition of northern Cordilleran basement from crustally derived magmas emplaced across the Selwyn Basin

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Summary

The Selwyn Basin in the northern Cordillera hosts several mainly high-K calc-alkaline, mid-Cretaceous plutonic suites that were derived predominantly by anatexis of the crust. Characterization of the protolith rocks to these plutonic suites, therefore, provides valuable information regarding the age and composition of basement rocks. Extensive whole rock isotopic and geochemical datasets for the plutonic rocks, combined with preliminary local Hf isotopic compositions for magmatic and inherited zircon, are used herein to provide inferences on the age and composition of basement rocks across this region.

Results

Several mid-Cretaceous plutonic suites extend across the western, northern and eastern Selwyn Basin. These include the widespread high-K calc-alkaline Tay River (99–96 Ma) and Mayo (98–95 Ma) suites, both derived from deep, large fraction and high-temperature partial melting of intermediate composition (60–65 wt.% SiO_2) metaigneous basement, likely driven by conductive and advective heat transfer into the crust from the underlying mantle. The Tombstone suite (94–89 Ma) is located along the northern and eastern limit of the Selwyn Basin where it overlaps geographically with the Mayo (northeast) and Tay River (southeast) suites, and includes plutons comprised of two distinct magma types: a high-K calc-alkaline melt sourced in intermediate-composition infracrustal rocks, and a shoshonitic LILE-rich magma sourced in enriched/lithospheric mantle.

Across the Selwyn Basin, intra-suite variation in whole rock isotopic compositions of this magmatism are controlled by geographic position, suggesting that several distinct crystalline basement domains are present. The southeast Selwyn Basin appears to be underlain by a relatively isotopically evolved metaigneous basement (e.g., continental magmatic arc) and preliminary Hf-isotopic compositional data for magmatic and inherited zircon from this region are compatible with a relatively young (T_{DM} = 1.1-1.5 Ga) and homogenous source of zircon. The northeast Selwyn Basin is likely underlain by similar but older (T_{DM} = 1.4-1.8 Ga) and (or) more isotopically evolved basement that may also have experienced a different metamorphic history. A limited amount of magmatic isotopic data suggests that similar continental arc basement underlies the western Selwyn Basin. The crystalline basement beneath the northwest Selwyn Basin, however, appears to lack input from isotopically evolved crust and may comprise predominantly old oceanic island arc rocks. Additional magmatic isotopic data and work on inherited zircon cores are needed to better constrain the age and composition of both

metaigneous and metasedimentary basement rocks from which much of the Cretaceous magmatism in the northern Cordillera was derived.

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