

Stratigraphic Age and Provenance of the Leech River Schist on Vancouver Island, British Columbia from LA-ICP-MS Depth Profiling

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Summary

The Leech River Schist (LRS) and Pandora Peak Unit (PPU) are two units of the Pacific Rim Terrane, that outcrop on southern Vancouver Island. These units are bound to the north (from Wrangellia) by the San Juan and Survey Mountain faults and to the south (from Siletzia) by the Leech River Fault. The stratigraphic ages of these metasedimentary rocks are uncertain due to a lack of biostratigraphic control, but they are believed to be Jurassic to Late Cretaceous. We undertook U-Pb depth-profiling of detrital zircon from these units to determine their age and provenance.

We identify three detrital zircon facies. The facies 1 sample derives from the PPU and yielded mid-Cretaceous maximum depositional ages (MDA). The sample yielded only Mesozoic grains with prominent populations in the Late Triassic, the Middle Jurassic to Early Cretaceous, and mid-Cretaceous. Detrital zircon populations in Facies 1 sample resemble similar aged rocks of the Pacific Rim Terrane west of the West Coast Fault near Ucluelet and suggest a common origin in the Coast Mountains Batholith (CMB) of British Columbia.

Facies 2 samples derive from the LRS and yielded mid-Cretaceous MDAs. They contain Paleozoic (420-320 Ma) and Mesozoic grains with prominent modes in the Jurassic (~169 Ma) and Cretaceous (99 Ma). Sediment was locally sourced and derived from the Sicker Group of the Wrangellia terrane and the Jurassic West Coast Crystalline Complex and Bonanza Group volcanics, all of which are exposed on Vancouver Island. A small population of Cretaceous grains likely derive from the CMB.

Facies 3 samples derive from the LRS and yield Maastrichtian to Paleocene MDAs. These samples are dominated by Triassic to Early Jurassic, Late Jurassic to Early Cretaceous and Late Cretaceous populations. Facies 3 samples resemble detrital zircon populations in the Late Cretaceous Nanaimo Basin. These detrital zircon populations derive predominantly from the CMB but contain up to 25% grains that exhibit Proterozoic cores with Cretaceous rims, which must derive from somewhere else. Core ages are bimodal with grains between 1700 and 1600



Ma and a prominent mode a 1380 Ma. Rim ages between 100 and 65 Ma pre-date deposition suggesting a detrital origin.

Our data reveal a two-step provenance history. Mid-Cretaceous rocks derived from local source areas within Wrangellia and the southern CMB. Late Cretaceous to Paleogene rocks derived from the same source areas as the Nanaimo Basin and included the CMB and an as-yet unidentified metasedimentary source.