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ELECTRONIC ARTICLE

Multiple thermotectonic events in a continuous metamorphic sequence, Mica Creek area, southeastern Canadian Cordillera

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ABSTRACT

U-(Th)-Pb isotope dilution and SHRIMP dating indicates that multiple periods of metamorphism and deformation occurred between ~160 and 60 Ma in the Mica Creek area, southeastern Canadian Cordillera. The metamorphic sequence (Barrovian assemblages in the garnet zone through the sillimanite–K-feldspar zone), fold generations, and Neoproterozoic stratigraphy are apparently continuous across the area, yet it broadly lies between regions that were tectonized at different times, Middle Jurassic to the east and middle Cretaceous–Paleocene to the west. Our dating along a north (lowest metamorphic grade) to south (highest grade) transect shows that three, km-scale tectonic age domains exist. In garnet schist of domain 1, peak metamorphism occurred at ~163 Ma and a minor thermal overprint occurred at 70–60 Ma. In migmatitic kyanite schist of domain 2, monazite inclusions in garnet grew at 110 Ma, matrix monazite and monazite inclusions in kyanite grew at ~85–73 Ma, and rims of some grains grew at ~60 Ma. Kyanite growth during peak metamorphism must have occurred after 73 Ma, possibly during intrusion of 61 Ma leucosome. In migmatitic kyanite schist and sillimanite schist of domain 3, peak metamorphism occurred at 99–93 Ma, and lesser thermal events occurred at ~280, 160, 110, and 70 Ma. We thus conclude that the thermal peak of metamorphism took place at different times in each domain, with peak events coinciding with secondary events in other domains. Age constraints on S_{1+2} are provided by dating variably deformed granitoid rocks. S_{1+2} developed before 72 Ma in domain 1, at least partly at 61-58 Ma and 122–63 Ma in domains 2 and 3, respectively. Our findings show that the Mica Creek area is the only known region in the southeastern Canadian Cordillera that was affected by the five recognized major periods of tectonism (175–160, 140–120, 110, 100–90, and 75–50 Ma). The key to understanding the geologic history is determining why several metamorphic and deformation events spanning 100 Myr occurred within a single tectonometamorphic complex with apparent geologic continuity. If continuity is only apparent, the domains may have been tectonically assembled along cryptic, unrecognized shear zones. However, if continuity does indeed exist, the events must have been locally superimposed on the complex.

* This article is designed to be read on a computer with internet access. The full text of the article can be obtained in pdf format at http://gmr.minsocam.org/Papers/v2/v2n2/v2n2abs.html.

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