Sequential return flow along a ramp, SE Canadian Cordillera

F.GERVAIS AND R.L.BROWN[1]

[1] Ottawa-Carleton Geoscience Centre, Department of Earth Sciences, Carleton University, Ottawa, Canada K1S 5B6; gervais_felix@yahoo.ca

The Monashee Complex (MC) exposes the deepest structural level in the hinterland of the southern Canadian Cordillera. It is located in the footwall of the Monashee décollement, a thrust-sense ductile shear zone that bounds the base of the Selkirk Allochthon (SA). Ductile flow and high-grade metamorphism in the SA occurred mainly in the Cretaceous, the MC was initially buried in the Cretaceous but ductile flow and high-grade metamorphism culminated in the Paleogene.

Perple_X'06 was used to model metamorphic evolution of a Sil-Kfs-Grt-Ky-Bt-schist located ~1 km structurally below the the Monashee décollement. A detailed P-T-t path is reconstructed by combining results of modelling in the TiMnCNKFMASH system with an extensive geochronological database [1,2]. Intersecting isopleths from a Grt core yield ~715^{o}C/0.67 GPa. Compositional profiles from Grt centres indicates a subsequent cooling phase to ca. 650^{o}C/0.62 GPa. Unusually hot Grt growth, which occurred in the Cretaceous, can be explained by flow of a hot SA channel along the Monashee décollement. Cooling is tought to be a result of subsequent relaxation of isotherms. While the SA was exhumed to upper-crustal conditions between ~100 and 65 Ma, rocks of the MC experienced renewed burial and heating in the Ky field between ca. 78 and 58 Ma [1]. The studied schist hosts leucosome containing Ky partially pseudomorphed by And. A U-Pb Zrc age of 58.5 ± 1.5 Ma [2] for the leucosome constrains the timing of peak P-T to >800^{o}C/1.0 GPA. The rock then followed a rapid cooling and exhumation path to the And field (<550^{o}C/0.35 GPa), constrained by a ^{40}Ar/^{39}Ar Hbl cooling age of 55.6 ± 1.7 Ma [2] obtained from a nearby amphibolite. These data indicate that rocks of the MC were emplaced below rocks of the SA at least 10 Ma after exhumation of SA. Peak metamorphic ages of 52-49 Ma [2] obtained from schists now juxtaposed below the studied schist suggest that the lower part of the MC cover sequence was rapidly exhumed ca. 6-7 Ma later.

A model of sequential return flow along a basement ramp is proposed. Rocks of the MC, initially a part of the basement that had been underthrust below a hot SA channel, were steadily buried and heated in the Ky field at rates of 0.3-0.5 km/My and 7-9^{o}C/My. The sudden density and viscosity drop across the Ms-out isograd episodically triggered the exhumation of part of MC rocks at dramatic rates of ca. 7 km/My and 85^{o}C/My.

References

[1] Foster G. et al. (2004) EPSL **228**, 125-142.
[2] Crowley J.C., and Parrish R.R. (1999) JMG **17**, 483-502.