$^{40}Ar/^{39}Ar$ thermochronology of the Ecstall pluton, British Columbia: Refined thermal history and implications for paleomagnetism

SARAH J BROWNLEE[1]*, PAUL R. RENNE[2], JOSHUA M FEINBERG[3] AND GARY R. SCOTT[2]

[1]University of California, Berkeley, Department of Earth and Planetary Sciences, 307 McCone Hall, Berkeley, CA 94720 (*correspondence: sbrownlee@berkeley.edu)
[2]Berkeley Geochronology Center, 2455 Ridge Rd, Berkeley, CA 94709 (prenne@bgc.org, gscott@bgc.org)
[3]University of Minnesota, Institute for Rock Magnetism, 310 Pillsbury Drive SE, Minneapolis, MN 55455 (feinberg@umn.edu)

$^{40}Ar/^{39}Ar$ cooling ages for hornblende and biotite from 12 locations along the Skeena River across the head of the ~91 Ma (U/Pb zircon [2]) Ecstall pluton support a proposed [1] reheating event, and are consistent with a long-lived thermal boundary (~5-8 Ma duration) at the contact with the Coast Mountains Batholith (CMB). Towards the thermal boundary, $^{40}Ar/^{39}Ar$ cooling ages decrease from 77.5±0.5 to 47.3±1.0 Ma for biotite, and 83±1.2 to 54.5±0.6 Ma for hornblende; the youngest ages for each are consistent with those from the adjacent Quottoon pluton of the CMB. The maximum difference in cooling age between hornblende and biotite is seen at ~10.5 km where the maximum hornblende age is 77.3±0.7 Ma and the minimum biotite age is 56.0±0.5 Ma.

Magnetic properties also appear to be affected by reheating: Approaching the thermal boundary, NRM intensities increase abruptly at ~13 km, and paleomagnetic inclinations increase gradually. The dominant Fe-oxide is exsolved hematite-ilmenite. Rock magnetic experiments indicate the presence of magnetite within single grains of hematite-ilmenite from locations less than ~13 km from the thermal boundary. TEM analyses confirm these results showing ~20-50nm-sized magnetite precipitates within hematite host regions. We propose that magnetite precipitates are a product of reduction of hematite during reheating. As a result, magnetic properties from samples less than ~13 km from the thermal boundary appear to be dominated by magnetite formed during reheating, and internal discordance of paleomagnetic poles thus reflects diachronous magnetization rather than internal deformation as has been inferred previously [2].

[1] Hollister *et al.* (2002) *EPSL* **221,** 397-407. [2] Butler *et al.* (2002) *JGR* **107,** 10.1029/2001JB000270.

The subduction of continental crust, the origin of PO granitoids, and the evolution of the Svecofennian shield

HANNES K. BRUECKNER[1,2]

[1]Queens College and the Graduate Center of the City University of New York, Flushing, NY 11367
[2]Lamont-Doerty Earth Observatory of Columbia University, Palisades, NY 10964 (hannes@ldeo.columbia.edu)

Slices of felsic continental crust subducted into the mantle during collisional orogeny may either undergo metamorphism and exhumation towards the surface as coherent high pressure/ultrahigh pressure (HP/UHP) terranes or, if stalled in the mantle, melt and return towards the surface as magmas. Some exposed HP/UHP terranes contain synorogenic granitoid bodies demonstrating that both exhumation and melting occur. Therefore, crust that is not exhumed, but remains trapped in the mantle should also melt when temperatures reach the appropriate solidi through conductive heating and/or radioactive decay. The generated magmas will intrude through the overlying mantle wedge and into the continental crust to form post orogenic (PO) granitoids and possibly anorogenic granitoids (± anorthosite suites) depending on the time required to reach solidus temperatures. The melt traverse through the wedge may explain the hybrid mantle/crust nature of most PO granitoids. Subducted terranes with hydrous phases will undergo hydrate-breakdown melting. Terranes lacking hydrous phases will melt by adiabatic decompression as heated crust becomes ductile and rises diapirically. Geochemical characteristics will depend on P-T conditions, the chemistry/mineralogy of the subducted terrane (especially the presence of hydrous phases), and the degree of melt interaction (i.e. the traverse length) with the mantle wedge. The mantle component should increase with distance from the collisional suture as a tapered mantle wedge increases in thickness. The evolution of the Svecofennian Shield (Baltica) documents a change from largely slab melting during the early/mid Proterozoic Svecofennian and Gothian Orogenies to both slab exhumation and melting during the late Proterozoic Sveconorwegian Orogeny to slab exhumation without melting during the mid-Paleozoic Caledonian Orogeny. This evolution may signal a change in the behavior in subducted continental crust as a result of the secular cooling of the mantle through time.