Recent advances in the geology of the South Mountain Batholith: anatomy and origin of a batholith

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Recent detailed geological mapping of the South Mountain Batholith (SMB) of southwestern Nova Scotia has delineated 260 granitoid bodies which have been assigned to 49 map units. Map units have been grouped into eight rock types that, in order of decreasing mafic mineral content (biotite, cordierite, garnet), include: biotite granodiorite (9.6% of the SMB); mafic porphyry (0.04%); biotite monzogranite (52.2%); muscovite-biotite monzogranite (8.9%); coarse grained leucomonzogranite (21.1%); polyphase intrusive suite (0.7%); fine grained leucomonzogranite (6.8%); muscovite leucogranite (0.7%). Muscovite is present in all rocks and increases from trace in granodiorite to >20% in some leucogranites. Biotite, with accessory zircon, monazite, apatite, ilmenite ± rutile ± xenotime ± allanite, decreases from >25% in some granodiorites to 0% in most leucogranites. Cordierite is present in trace amounts in most rocks and may constitute up to 5% of the mode.

The mapping has delineated at least 13 plutons within the SMB. These plutons can be divided into biotite-bearing (granodiorite-monzogranite) and muscovite-biotite-bearing (monzogranite-leucomonzogranite-leucogranite ± granodiorite) compositional types. Plutons may be lithologically composite, consisting of several rock types or uniform, comprising a single rock type. Recent geochronological data ($^{40}Ar/^{39}Ar$, Pb-Pb) on mica and whole rock suites, representing the entire compositional range, indicate that the plutons were emplaced ca. 370 Ma.

Geochemical analysis of the eastern SMB indicate that all rocks are peraluminous (A/CNK 1.13-1.29) with low Ca (0.41-2.87%) and high SiO_2 (67.10-73.90%) contents. Most major and trace elements display smooth variation trends attributable to the removal of biotite and included accessories, plagioclase and alkali feldspar by fractional crystallization. Most plutons display compositional zoning (normal and/or reverse) defined by systematic variations in mineralogy and geochemistry. These variations result from pluton-scale fractional crystallization. Each pluton represents one or more magmas that rose, coalesced with adjacent plutons and fractionated *in situ*.

Oxygen isotope data (9-12 °/∞) and $^{87}Sr/^{86}Sr$ (0.7080-0.7100 except >0.720 for the Davis Lake Pluton) are consistent with derivation of the SMB magma via partial melting of metasedimentary and altered volcanic rocks. The aluminous and mafic granulite xenoliths from Tangier are probably a suitable source material for the SMB magma. This requires that the SMB magma was generated during the collision of the Meguma Zone.