Transpaction in Meguma Group rocks during emplacement of the South Mountain Batholith, Nova Scotia

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Preliminary study of porphyroblast/cleavage relationships in the South Mountain Batholith's (SMB) aureole in Nova Scotia, shows that the earliest metamorphism occurred at the same time as regional cleavage formation in Meguma Group country rocks. The space required for batholithic intrusion into a regional general shear zone was in part generated by extensive volume loss in the country rocks. Cleavage continued to develop until very late in the batholith emplacement history.

Previous workers have documented up to 60% volume loss during the regional cleavage formation in Meguma Group rocks. We have identified three stages of porphyroblast growth in the contact aureole of the SMB related to pressure solution cleavage formation. The earliest assemblage is represented by biotite, qtz-chlor-Fe oxide pseudomorphs after garnet, and elliptical qtz-white mica aggregates which were either cordierite or an aluminosilicate mineral and are aligned with their long axes parallel to a domainal spaced cleavage. These early minerals are preserved in lithons between solution-cleavage planes. Garnet pseudomorphs were unaltered before deformation because cleavage wraps around them, and the alteration products lack the strength to maintain garnet morphology. The second assemblage includes andalusite, cordierite, and a second generation of biotite. Deformed andalusite was stretched parallel, and shortened perpendicular, to the foliation; post-andalusite strain ratios of Rs = 2.5 in XZ sections were obtained using Fry and deformed line distribution analyses. Cordierite porphyroblasts preserve a widely spaced cleavage that is parallel to a more closely spaced cleavage, containing new biotite, which wraps around them. The cleavage relationships are consistent with growth of these minerals during cleavage formation. The youngest metamorphic minerals are chlorite, muscovite, and undeformed staurolite porphyroblasts surrounded by moats of equant quartz; these may represent a retrograde reaction of biotite and aluminosilicate to staurolite, muscovite, and chlorite. Post-deformation alteration of the quartz/mica ellipses and garnet may be related to this retrogression event.

Formation of cleavage during transpression should result in steep stretching lineations unless the coaxial contribution is relatively small compared to the non-coaxial component. However, the Meguma Group rocks are seldom lineated, and magnetic lineations in the plutons are sub-horizontal (Benn *et al.*, 1997). These findings are consistent with regional "transpaction", in which intrusion of dikes and laccoliths is assisted by non-coaxial strain and normally-directed volume loss.