

Emplacement style of the Wentworth plutonic complex, Cobequid Highlands

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The 363 - 350 Ma Wentworth plutonic complex in the Cobequid shear zone of the Appalachians is coeval with an up to 5 km thick pile of volcanic rocks of the Fountain Lake Group. The magmatic evolution of the Wentworth plutonic complex through time can be constrained by the cyclic eruption of the comagmatic volcanic rocks. Two cycles of eruption of rhyolites with minor basalts (Byers Brook Formation) correspond to emplacement of the Hart Lake - Byers Lake alkali granite. Three cycles of eruption of tholeiitic basalts (Diamond Brook Formation) correspond to emplacement of the Folly Lake gabbro. The gabbro melted the granite into which it was intruded and a felsic and a mafic magma co-existed and cooled together. Larger late granite intrusions appear to be felsic differentiates of a deeper magma created by mixing or assimilation of granite (or granitic magma) by the gabbroic magma.

The Wentworth plutonic complex lies on the north side of the dextral Rockland Brook Fault, near the western tip of a wedge-shaped basement block (Bass River Block) of the Avalon terrane. Field observations of mesoscopic structures and map contacts show that the plutonic bodies at all structural levels are related to transpressive strike-slip faults. Dykes parallel to the

mylonitic foliation in the Rockland Brook fault zone and at the contacts between igneous phases suggest that the plutons developed largely through dyke to pluton construction. However, structures within the gabbro pluton suggest that it may have risen as a diapir.

In the Cobequid Highlands, dyke-to-pluton construction and diapirism are related processes. Dyking of a series of magmatic pulses overcame compressional tectonic forces and set up the system. Magmatic-partitioned transpression and diapirism extended the magmatic activity over at least a 10 My period. Magmatic-partitioned transpression was the emplacement mechanism that enabled mafic magma to intrude at higher structural levels by thermomechanically softening the crust, which facilitated the dyke-to-pluton construction of the Hart Lake-Byers Lake pluton and triggered the formation of the Folly Lake diapir. The localization of voluminous magmatic activity over 10 My in the western part of the Wentworth plutonic complex, compared with the short-term magmatism elsewhere in the Cobequid Highlands, was a consequence of eastward extrusion of the Bass River block and the magmatically-partitioned transpression.