Digital mapping of the Wentworth plutonic complex, Cobequid Highlands, Nova Scotia, and petrology of its felsic phases

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The Wentworth plutonic complex (the Folly Lake and Hart Lake - Byers Lake plutons of Donohoe and Wallace) is late Devonian-early Carboniferous and is located in the eastern Cobequid Highlands. Mafic magma produced as a result of extension of the Magdalen Basin was the heat source for lower crustal melting to produce felsic magma. Both magma types were emplaced along the Rockland Brook fault. New 1:10 000 mapping of the plutonic complex shows it to be a composite pluton of mafic rocks (gabbro/diorite) and felsic rocks (granite, rhyolite and granodiorite). The southwestern part of the pluton between Fountain and Sutherland lakes consists almost exclusively of gabbro/diorite. Farther east, around Folly Lake, gabbro-diorite includes about 10% granite magma pods and veins. The gabbro/diorite is bounded to the north by a zone, 1 to 3 km wide, of subequal amounts of granite and gabbro/diorite. The northern and eastern parts of the pluton form a belt, 1 to 4 km wide, of principally medium grained granite, becoming fine grained to rhyolitic in the extreme east.

The granites have A-type chemistry and their trace element composition is typical of "within plate" granites. Amphiboles, either calcic or sodic, are abundant within the granites. Sodic amphiboles are restricted to coarse grained granites and include arfvedsonite, riebeckite, katophorite, winchite and richterite. The replacement of other sodic amphiboles by riebeckite and alteration of the dominant K-feldspar to albite both suggest sodic metasomatism. The calcic amphiboles, which have been found in a variety of rock types but never coexisting with sodic amphiboles, include edenite, ferro-edenite, ferro-edenitic hornblende, ferro-actinolite, ferro-hornblende, magnesium hornblende and silicic ferro-edenite. Hedenbergite and ferrohedenbergite replace calcic amphiboles. Biotite is found in almost all lithologies and chemically belongs to the phlogopite-annite series. Thus, the mineralogy of felsic phases of this plutonic complex resembles that of Devonian alkaline complexes in the Avalon zone, such as that of the Welsford igneous complex in New Brunswick.