Thermochronologic evolution of the Cobequid Highlands, Nova Scotia

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The Cobequid Highlands of northern Nova Scotia occupy an east-west trending belt (*ca.* 160 km long, 10-20 km wide), forming the eastern component of a major tectonic element, the Cobequid-Chedabucto fault zone. Recent $^{40}Ar/^{39}Ar$ geochronology of diorites, granodiorites, granites, and mafic dykes, has produced an increased understanding of igneous and tectonic activity for this region. It is now known that the majority of latest Devonian-early Carboniferous granitic magmatism is confined to a very small window of time. This was followed by mafic-magmatic activity and ductile deformation within an active fault system. Direct observations derived from these new data indicate changing patterns of tectonic activity within the Cobequid Highland belt, occurring throughout the early Carboniferous.

Present $^{40}Ar/^{39}Ar$ dating with existing U/Pb data of granitic lithologies indicates the majority of igneous-felsic activity was confined to the Tournaisian epoch. The presence of granitic lithologies reflects trapping of mafic magma producing significant crustal melting. The $^{40}Ar/^{39}Ar$ dating of mafic lithologies indicate that mafic magmatism spanned the Tournaisian, Visean and early Namurian epochs, suggesting persistent activity. The presence of mafic lithologies (tholeiitic diorite, gabbro, and lamprophyric dykes) suggests the presence of easy pathways associated with rifting. The large volume of Visean mafic products in the eastern Cobequid belt is contemporaneous with compressional features located in extreme western regions of the belt. Regionally, this early to middle Visean activity is correlated with the change in tectonic style between the Horton (clastic) and Windsor (chemical) groups within the Magdalen Basin, suggesting extension and compression within the belt were associated with the early evolution of the basin. Further $^{40}Ar/^{39}Ar$ dating of secondary minerals implies that high temperature Na-metasomatism occurred shortly after the emplacement of some granitic plutons. Pervasive potassic alteration along the entire Cobequid fault is of early Namurian age, correlated with the intrusion of lamprophyric dykes.