

PETROGENESIS OF LAMPROPHYRE DIKES AND RELATED WHITE MOUNTAIN - MONTEREGIAN INTRUSIVE COMPLEXES

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Models for the production of Mesozoic hypabyssal and plutonic magmas in northern New England and southern Quebec (White Mountains and Monteregian suites; lamprophyre dikes) must account for their orientation patterns, age relationships, and compositional variation. This paper relates these magmas to deep-seated fracture zones acted upon by crustal stresses associated with the opening of the Atlantic. The distribution of dikes in space and time, as well as chemical and petrographic evidence, suggests that the camptonite dikes of New England and Quebec represent parental magmas of many of the plutonic complexes. These alkaline magmas formed by high-pressure melting of mantle peridotite in the presence of volatiles with high CO₂/H₂O ratios. Several mechanisms may have acted to produce the range of exposed rock types, including: 1) partial melting of the mantle and/ or lower crust under varying CO₂/H₂O pressures, 2) separation of immiscible silicate liquids, 3) crystal-liquid fractionation, and 4) assimilation of crustal rocks. Quartz-rich members of the White Mountain magmatic suite, including the Conway granite, are volumetrically most important near the axis of the Merrimack synclinorium, and possibly originated by anatexis of downwarped lower crust as heat flow increased during incipient Jurassic rifting. The secular variation in dike orientations and alignments of plutonic complexes is related to early stages of the development of the North Atlantic. Magmatic activity in New England ceased about 95 m.y. ago when rifting began in the northernmost Atlantic.