

Prince Edward Island's Alkaline Igneous Rocks

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A late Permian? lamprophyric sill on George Island in Malpeque Bay represents the only known exposure of igneous rocks in Prince Edward Island. Geochemical modelling suggests that phlogopite and other Ti bearing phases in the source regions for many lamprophyres help control magma Rb and Ti concentrations but they had only a minor effect on the Malpeque Bay magma. The unimportance of these phases may be related to the nature of the metasomatic event which enriched the source (and resulting magma) by only small amounts in K, Rb and Cs. More substantial enrichment is shown by Sr, Ba and the light REE, but the high valency cations (e.g. Hf, Ta, U, Th, Zr, Nb) were

increased the most. Geochemical comparison of the lamprophyre with other highly alkaline rocks suggests that the metasomatizing fluid (or magma) was CO₂ rich. It either carried K and Rb through the lamprophyre source region, leaving behind only high valency cations, or was incapable of carrying the former elements. The presence of spinel ilmenites as well as Fe-Mg-Ni relationships show that the lamprophyre represents a primary melt. Various geothermometers give low equilibration temperatures for the ilmenite xenoliths (~ 970 degrees C) and show that they cannot represent the magma's source.