Abstract

The Portobello Peninsula is made up by volcanic sediments, lava flows and numerous dikes. Deposition of sediments and lava flows are thought to be early in the evolution of the Dunedin Volcano.

The lava flows of Portobello Peninsula are silica saturated, belonging to a lineage differing from the two major lineages previously inferred to exist in the volcano (Coombs and Wilkinson, 1969). This new lineage comprises the rock series basalt-potassic trachybasalt-shoshonite-latite-quartz trachyte following the TAS classification scheme of basaltic rocks by Le Bas et al. (1986). The lineage is mainly separated from the other two by the presence of normative hypersthene and/or quartz. The rocks of intermediate composition also have a lower total alkali content than its undersaturated equivalents.

Oversaturation in magmas from the Dunedin volcano is caused by a process involving fractionation of kaersutite combined with long residence times in the lower crust/upper mantle.

The potassic nature of the oversaturated lineage originates from crustal/magma interactions as the magmas ascended through the crust.

The possible involvement of kaersutite in the oversaturated lineage, has implications for magma genesis in the Dunedin Volcano. A model comprising different degrees of partial melting, fractionation of kaersutite and crustal contamination, can possibly explain the wide range of geochemical behaviour documented within the volcano.

The dikes on Portobello Peninsula are divided into two assemblages with a clear age difference between them. The dike orientations suggest that the extensional tectonic stresses have rotated clockwise from a WNW-ESE orientation into a NW-SE orientation during the later parts of volcanic activity in the area.