

Glaciovolcanic and magmatic evolution of Ruapehu volcano, New Zealand

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Chronostratigraphic studies of continental arc stratovolcanoes reveal the timing and types of past eruptive behaviour and are therefore crucial for constraining magma evolution models as well as the future eruption potential in these active settings. Such studies can be complicated by complex stratigraphic relationships caused by glaciovolcanism (eruptions in the presence of ice), glacial erosion and sector collapse for edifices that have been glaciated. These issues are relevant to the numerous high-altitude cones that define Earth's continental volcanic arcs. A key example of this is Ruapehu, which is an active andesite-dacite stratovolcano located at the southern end of the Taupo Volcanic Zone, New Zealand. The growth of the Ruapehu edifice has occurred throughout coeval eruptive and glacial histories since ~200 ka. Here, new high-precision $^{40}\text{Ar}/^{39}\text{Ar}$ ages and whole-rock major and trace element data for Ruapehu lava flows are integrated with geological mapping and glacier reconstructions. The data provide a high-resolution chronostratigraphic and geochemical framework for investigating processes of ice-marginal lava flow emplacement and magma generation. In particular, the following concepts are addressed in this study: (1) the potential for ice-bounded lava flows to provide paleoclimate information; (2) the role of deglaciation in triggering Holocene sector collapses; (3) the variable extent of crustal assimilation in andesite-dacite magma genesis during the lifetime of a stratovolcano.

Keywords: lava-ice interaction, andesite petrogenesis, Ruapehu volcano