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Mt. Ruapehu is Te Whare Toka o Paerangi (The House of Stone of Paerangi, Ngāti Rangi ancestor), Matua te Mana (The Powerful One; “Mana” means prestige and enduring, spiritual power) in Ngāti Rangi maori culture. The Waikato-iti stream, in the Rangipō Desert, is Te Onetapu (sacred place) where Ngāti Rangi people rise their “karakia” to the volcano, their ancestor.
Dedicated to the Ngāti Rangi Iwi on behalf of all the indigenous communities living around active volcanoes in the world, who constantly teach us about the unfolding of life, the dynamic interdependence between people and the environment, and how to integrate all sources of knowledge to consciously and truly build sustainable communities

He Ruruku: Mai ara rā!

Mai ara rā! Mai ara rā!
Mai ara rā te Tupua!
Mai ara rā te Tawhito!

Tēnei au
Tēnei au te rangahau ana, ki te ao, ki te pō
Kia Ranginui e tū iho nei,
Kia Papatuānuku e takoto ake nei.

Mai ara rā, mai whea ra tōku ahunga mai?
Tāhuri whakataumaha, hurt whakamāmā
E te Kāhui Maunga ko wai ra koe?

Inā, Matua Te Mana te aunahi pūheta matahi
Pikimai Rawea te kai-kukume ake matua whenua rō wai

Te rongo nei ia hīhī,
Te rongo nei ia hāhā me huka tātairango.
Tina, tina toko te manawa ora, he manawa ora!

Ko te Roi-a-Rangi mo Rua-te-Tipua
Ko te Roi-a-Rangi nō Nukuahu e
Te pātukituki ka tū whakahirahira Kāhui Maunga mā.

Ko toka pokohiwi ka hora maru tapu, e Ngā Turi-o-Murimetotu
Te ahi kā o Paerangi i te Whare Toka
Te puta mai te Kāhui-o-Rangi, te Kāhui-a-Rua
Tōna hekenga mai i Te Wai-ā-Moe ki Pareteataitonga
Ko te ara hekenga, ko te ara hokinga mo ngā uri kōtuku
Ka tuku, ka tuku atu i ngā hau kaha ia Parakakariki, ia Mouwhakaarahia

Hei tohu, hei whakaatu ki te ao!
Whiti, whano, hara mai te toki!
Haumia! Hui e!
Taiki e!¹

¹ Karakia (i.e. prayer) offered by Ngati Rangi Iwi to Mt. Ruapehu, their ancestor. Provided by Che Wilson, Ohakune 2011, Aotearoa.
ABSTRACT

A new detailed stratigraphy was developed for a sequence of pyroclastic deposits including the largest known eruptions associated with Mt. Ruapehu, deposited in the period ~27-10 ka BP cal. From the largest Plinian eruption deposits in this sequence, subtle lithofacies variations within componentry, pumice textures and sedimentary features were used to identify a systematic change in eruptive conditions over time. Early eruptions involved steady eruption columns, while younger eruptions involved unsteady, collapsing columns. Isopach and Isopleth (pumice and lithic) mapping of most widespread and distinctive units show that the largest explosive eruptions known from this volcano attained peak column heights between 22 and 37 km, with mass discharge rates reaching $10^7$-$10^8$ kg/s.

To characterise the conditions controlling the style of Plinian eruptions at this andesitic volcano, and to explain the systematic variation in column stability over time, five key units were sampled in detail, exemplifying the major contrasting lithofacies. The sampled tephras underwent grain-size analysis, along with quantification of componentry, porosimetry and density on particles of a range of size classes, as well as 2D and 3D microtextural analyses of juvenile pumice clasts to define vesicularity and crystallinity. In addition, physiochemical factors such as melt-evolution and volatile-contents were determined by analysing bulk pumice, glass-inclusions and residual glasses with electron microprobe and FTIR-spectroscopy.

Bulk compositions of these tephras vary from basaltic-andesite to andesite (56-62 wt.%, SiO$_2$), and had minimum pre-eruptive H$_2$O contents of 4-5 wt.%. The evolution of eruption behaviour over time was not correlated to any progressive change in bulk geochemical properties, but instead resulted from variations in physical processes within the conduit. Ascending magmas experienced heterogeneous bubble nucleation, and later-erupted units showed increasing degrees of rheological heterogeneities developed across the conduit. Differences between units were due to changes in the magma decompression rates, the degree of bubble-crystal-melt interactions and bubble shearing, as well as the composition of the residual melt. Conditions that led to the most variable physical states of the magma reaching the fragmentation level resulted in the highest variability in pumice textures, the greatest range in styles of fragmentation, and the most unstable eruption columns.

A new model describing the pre-eruptive magma storage region, conduit processes, magma fragmentation, and pyroclastic dispersal during Plinian eruptions at Mt. Ruapehu is proposed. This hypothesises that eruption column unsteadiness and collapse occurs when magma shear reaches extreme levels along the conduit under conditions of low isolated porosity (<3 vol.%). This situation also generates the worst-case hazard scenarios expected for Ruapehu, eruptions, where Plinian columns of over 30 km may produce widespread tephra fall, as well as partially collapse to generate pyroclastic density currents of over 15 km runout.
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