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Characteristics of rhyolite generation at Taupo volcano, New Zealand: implications for the nature of the sub-surface plutonic system

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The young eruptive history of Taupo volcano encompasses the growth and destruction of the large (530 km^3) Oruanui rhyolitic magma body at 26.5 ka, followed by subsequent rejuvenation of magma sources below the volcano. Integration of chronostratigraphic, petrological and isotopic studies at the whole-pumice and single-grain scales are used to provide an integrated picture of this history. The following are demonstrable. 1. Even in crystal-poor rhyolites such as the Oruanui, many grains are antecrysts or xenocrysts. The Oruanui crystal-poor rhyolite body was very much an open system, with influxes of crystals (plus melt) from remobilised older crystal mush, melted metasedimentary rocks and plutonics, and crystal-poor basaltic to andesitic magmas. 2. All the Taupo rhyolites were well mixed prior to eruption, no significant gradients suggest any physical or chemical stratification of the holding chamber(s). 3. Mafic magmas rose into, interacted with, and ponded on the floors of crystal-poor rhyolite in the Oruanui and Waimihia (3.5 ka) examples. 4. Pre-Oruanui activity involved contrasting magma types being generated simultaneously, but erupting from geographically separate vents. Post-Oruanui activity has seen (subtly) contrasting magma groups being erupted from vents in the same geographic area, but separated in time. The Oruanui and post-Oruanui magmas are different and do not appear to be related by consanguinity or by mixing – the Oruanui eruption effectively destroyed its magma body. These features are consistent with rhyolite magma generation at Taupo that is exceptionally fast, driven by high fluxes of mafic magmas into a thinned, highly het-

erogeneous crustal melange of metasedimentary and igneous lithologies.