Understanding temporal and spatial geochemical and isotopic variations in a large silicic volcanic center, Taupo Volcanic Zone, NZ

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The Taupo Volcanic Zone (TVZ) in New Zealand is one of the most active volcanic zones in the world. Rhyolites erupted from the Okataina Volcanic Center (OVC) within the TVZ vary in chemical composition over relatively small distances and within single eruptions. Eruptive products record the mingling of chemically distinct melts, but the timescales on which these melts are amalgamated prior to (or during) eruptions is not well understood. The relative roles of juvenile input and crustal recycling in the generation of melts are also not well constrained. This study presents the results of new trace element, ^{238}U-^{230}Th age data and hafnium isotopic data obtained from zircons of the 0.7 ka Kaharoa and 4.8 ka Whakatane eruptions, the most recent rhyolitic eruptions from the OVC.

Zircons from both eruptions display a wide range of ages, with most grains yielding ages ca. 0-50 ka but several displaying ages >300 ka. Combined age and trace element data for both the Kaharoa and Whakatane zircons suggest that each eruption sampled zircons from a variety of coeval yet geochemically distinct melts. Kaharoa zircons show large variation in trace elements within older (28-56 ka) zircon cores, but more homogeneous populations present in younger (0-17 ka) zircon surface analyses. The chemically restricted rim data suggest that zircons derived from multiple sources underwent crystallization in the same melt just prior to eruption. Zircon ε_{Hf} data were acquired from zircons in order to chemically fingerprint distinct melts that existed prior to amalgamation and eruption. ε_{Hf} values within zircon range from approximately +2 to +9 at a given time, implying that discrete melts within the magma reservoir record the signature of an isotopically juvenile end-member component.