



New Zealand Andesites: Priming the lithosphere for a supervolcano.

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In the Taupo Volcanic Zone (TVZ) of New Zealand, one of the most frequently active rhyolitic magmatic systems on Earth, the cycle of volcanism is related to oblique subduction of the Pacific Ocean Plate beneath the continental lithosphere of the North Island. The central part of TVZ, that contains the major caldera complexes of Taupo, Okataina and Whakamuaru is actively rifting and subsiding. In central TVZ lithics in ignimbrites, regional magnetics, gravity and geothermal drilling testify to the existence of andesite and basalt beneath a blanket of ignimbrite. Peripheral to this region, eroded andesite edifices also infer an extensive distribution. Basalts and andesites are therefore vital components of the processes that lead to rhyolitic volcanism, priming magma chambers for eruption on time-scales of ~ 200 k. In this scenario, the seismic swarms identified to the SW of the present day TVZ near Wanganui could be an indication of a precursory process that thermally conditions the lithosphere prior to the onset rhyolitic magmatism.

Ruapehu volcano at the SW extremity of TVZ, extends back at least 250 ka and is a useful case study. We suggest that the present ~ 25 year eruptive cycle at Ruapehu is the normal “background state” of the volcano and that superimposed on this activity were periods when magma flux exceeded background by several orders of magnitude. We have shown that Ruapehu andesites are in reality aggregates of crystals and melts generated by polybaric mixing – mingling, fractionation and assimilation events in the lithosphere. We have also detected systematic changes in chemistry with time, such that the early andesites are consistently more primitive, with lower Sr- and higher Nd-isotopes than later andesites that show strong AFC trends. Occult in many of these andesites are traces of rhyolitic melts that are chemically indistinguishable from rhy-

olites in the major caldera centres. Moreover, the overlapping array of Sr, Nd and Pb isotopes for basalt, andesite and rhyolite in TVZ suggest links that we can trace from lower to upper crust.