Short-term geochemical variation within a single eruption event: Mount Edgecumbe volcano, Bay of Plenty, New Zealand

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A re-evaluation of the petrogenetic links between the andesites and rhyolites from the Taupo Volcanic Zone of New Zealand's North Island by Price *et al*. (2005) led to the proposal of an evolutionary pattern from andesite-dominated to rhyolite-dominated magmatic systems with time.

In order to understand the processes involved in this long-term shift towards catastrophic rhyolite eruptions, we must first ensure that we fully comprehend the factors controlling short-term variations. However, detailed, stratigraphically controlled sampling of well-documented single eruptive episodes and eruptive sequences has revealed considerable internal complexities at several arc-type volcanoes.

Here we present analyses of multiple samples from an accurately dated, (3115±35 yrs BP, Carroll *et al*. 1997) andesitic block- and ash-flow deposit on Mount Edgecumbe at the active volcanic front of the TVZ. Our results are based on whole-rock analyses for major element oxides, trace and rare earth elements in addition to Sr and Nd isotope ratios resolving the extent of geochemical variability within a strict time-frame.

References

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Cooling rates contraints on the accretion of the plutonic crust at fast-spreading mid-ocean ridges

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We report the results of a thermo-mechanical model of crustal flow beneath fast spreading mid-ocean ridges considering the effect of deep, near off-axis hydrothermal cooling and variable igneous accretion modes. The accretion mode determines the flow lines along which gabbro crystallize and the lateral advection of heat and mass. Near, off-axis hydrothermal cooling determines the shape of the magma chamber and viscosity, which influence the stream function and the shape of flow lines along with plutonic gabbro crystallize. The cooling rate of the plutonic crust along a flow line depends on the velocity and geothermal gradient along it, which are in turn imposed by: (i) the accretion mode, (ii) the extend of off-axis hydrothermal cooling, and (iii) conductive thermal rebound far from the ridge axis. The conventional wisdom that the igneous and metamorphic cooling rates of exposed sections of lower oceanic crust are similar and both reflect the on-axis thermal cooling of the oceanic crust is too simplistic. The cooling history is inherently related to the method used to retrieve it; particularly to the temperature interval recorded by the method. The cooling history may integrate cooling at different depths at distances from the ridge axis, which are not necessarily those of their final depth of emplacement. While igneous cooling rates record the thermal structure of the magma chambers, metamorphic cooling rates may record different extend of the off-axis thermal structure depending on the effective temperature of diffusion initiation and closure temperature. Igneous and metamorphic cooling rate variations with depth are markedly diferentent for a given accretion mode and, if available, both might be used to discrimante among different scenarios proposed for the accretion of the oceanic crust a fast-spreading mid-ocean ridges.