Slab or Crust – K_2O Enrichment at Egmont Volcano, New Zealand

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Mt Taranaki is the largest andesitic stratovolcanoin New Zealand and represents the most westtrly expression of subduction-related volcanism on the North Island. It is located 140 km west of the Taupo Volcanic Zone and lies 180 km above aWadati-Benioff Zone. Taranaki is recognised as a high-K arc volcano and was used to construct the Haterton and Dickenson model of increasing K_2O with depth to the slab (K-*h* relationship).More recent studies, however, show that K_2O behaviour in the Taranaki volcanics is time- rather than slab depth-dependent.

The last 150,000 years of volcanic activity on Taranaki are characterised by a series of alternating episodes of edifice construction and destruction. In this study, eleven debris avalanches generated by large collapse events have been sampled from ring-plain successions around the volcano. These deposits primarily contain fragments of strata that built up the previous edifice and clasts represent the diversity of rock types produced by the volcano before it collapsed. Lithologies range between basalt and evolved andesite with most samples being of basaltic andesite composition. The oldest suites display the broadest range of compositions (48.65 – 58.81 % SiO_2) and include more primitive rocks that have not been found in younger suites; the latter comprise predominantly andesite.

The evolution to less primitive compositions is accompanied by increasing K_2O with decreasing age. K_{55} values increase from 1.65 % for the oldest rocks (> 130 ka) to 2.65 % for the latest (< 1 ka) eruptives. The most dramatic rise in K_2O occurs in the youngest (< 10 ka) rocks and only these are classed as high-K andesites. Low field strength elements (LFSE) are coupled with K_2O while some high field strength elements (HFSE) show similar trends to K_2O only on samples younger than 70 ka. The oldest, most primitive rocks do not show a clear subduction signature; this appears to become more distinct with time. Either the slab component of the melts becomes more dominant with time or there is increasing interaction with underplated crust.