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Petrological Evolution of Mt Taranaki, New Zealand

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Mount Taranaki is a calc-alkaline strato-volcano that poses a significant volcanic threat to the North Island of New Zealand. It is located behind the main arc-front, but a lack of geophysical evidence makes the depth to the underlying Benioff Zone uncertain. In spite of this, the erupted magmas are both relatively potassic and silica-poor, although sub-alkaline. It has been suggested that the Taranaki magmas were shaped by a combination of deep crustal processes and source materials that changed over time as the result of an early intraplate influence. However, comparison of a large analytical dataset for Taranaki whole-rocks, distal tephra glasses, cognate xenoliths and phenocrysts, with published experimental data for relevant systems, shows that the Taranaki magmas evolved by crystallisation differentiation of primitive basaltic magmas within an open magmatic system producing continuous fractionation inside the upper crust. There is no evidence of significant crystallisation at greater depths nor of deviation from the primary calc-alkaline trend of the erupted magmas.