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RECONSTRUCTING THE COMPLEX HISTORY OF A
SMALL-VOLUME BASALTIC VOLCANO
(NGATUTURA VOLCANIC FIELD, NEW ZEALAND):
THE ROLE OF SUBSURFACE PROCESSES AND
IMPLICATIONS FOR DIATREME FORMATION.

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ABSTRACT

Monogenetic volcanism is very common on continents and often occur very close to civilisation. Limiting the ability of volcanologists to predict the location and extent of future eruptions at monogenetic volcanic fields is the lack of knowledge about subsurface processes at small basaltic volcanoes. This research aims to utilize exceptional exposures of subsurface volcanic structures at a coastal section in the upper North Island of New Zealand to investigate the role of subsurface processes in the development of a small basaltic volcano. Exposures include dykes, lava flows, peperite and hyaloclastite deposits, a lava pond, and diatreme. Along with detailed mapping, K-Ar age dates reveal the complex history of the Ngatutura Bay Volcanics as syn-sedimentary volcanism in a shallow marine environment. Volcanism at Ngatutura Bay is shown to have occurred in two phases, the first around 3.34-3.22 Ma, and the second at c. 1.81-1.72 Ma. Subsurface processes documented include magma-country rock interactions, the role of groundwater, magma ascent, and thermal alteration of country rock. The importance of tectonics and rock structure at small basaltic centres is also demonstrated. Moreover, deposits of the diatreme were analysed for grain size and lithic componentry. The local stratigraphy is composed of well-defined lithologies, each with unique textural and visual properties, enabling the identification of lithics in the diatreme. The diatreme deposits are described as five distinct lithofacies, and together with grain size and componentry data, the series of events by which the diatreme formed is constrained. A conceptual model is drawn for the formation of the diatreme, which is compared to current models and theories.

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