

A refined geochemical dataset of volcanic rocks from the Kermadec intra-oceanic arc

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Accurate sampling of submarine volcanic rocks is made more difficult by the sampling equipment used, the variable preservation of the rocks, and the geographic remoteness of the sampling operations. Adherence to pre-set sampling and data handling procedures is necessary to ensure that the final dataset is representative, balanced and contains only analyses of an acceptable quality (i.e., are high precision, adjusted to international standards, and exhibit minimal effects of alteration or seawater contamination).

The 2004-2005 NZAPLUME III, SWEEP VENTS and NZASRoF expeditions to the Kermadec arc, mapped and sampled seven volcanic centres newly discovered along the northern sector of the arc-front, and revisited Monowai, now known to have a caldera immediately to the north of the previously mapped cone. These complex centres typically include one or more calderas with multiple associated volcanic cones.

Recovered lavas range from high-alumina basalt to rhyolite, confirming the occurrence of evolved compositions associated with caldera structures along the entire length of the Kermadec arc. Three of the volcanic centres exhibit the full compositional range from basalt to rhyolite, three are basalt-andesite, and the remaining two entirely rhyolitic.

In contrast to published results for the southern Kermadec arc, there is little evidence for compositional bimodality, with the data set containing sub-equal proportions of basalt, basaltic andesite, andesite, dacite, rhyodacite and rhyolite. Despite the variety of volcanic edifices sampled, all of the volcanic centres yield tight chemical correlations for major and trace elements, which are interpreted to indicate a combination of mixing or fractionation processes.

There is a suggestion, yet to be fully established with trace element/isotopic modelling, that three of the centres, spanning more 200 km of arc-front, are genetically related.