# Colville and Kermadec Ridge age and Geochemistry: New insights into the proto-Kermadec arc petrogenesis and arc splitting, SW Pacific

C. TIMM[1,2] C.E.J. DE RONDE[1], K. HOERNLE[2], B. COUSENS[3], J.-A. WARTHO[2], F. HAUFF[2], F. CARATORI TONTINI[1]

[1]GNS Science, PO Box 30-368, Lower Hutt, New Zealand, c.timm@gsns.cri.nz

[2]GEOMAR, Helmholtz Centre for Ocean Research, Wischhofstrasse 1-3, 24148 Kiel, khoernle@geomar.de

[3]Carleton University, Department of Earth Sciences, 1125 Colonel By Drive, Ottawa ON. K1S5B6, Canada

To date, most research at the Kermadec arc has focussed on the active arc front volcanoes leaving the Colville and Kermadec Ridges that border the arc system underexplored. Between 2013 and 2017, these Ridges have been surveyed with R/Vs *Tangaroa* (Colville I-III) and *Sonne* (SO255 Vitiaz) south of ~28˚S to understand their petrogenesis and splitting of the former proto-Kermadec (Vitiaz) Arc. New $^{40}Ar/^{39}Ar$ ages range from ~7.5-2.6 Ma, yet mainly clustering ~3.8-4.8 Ma, suggests that arc volcanism at the Colville Ridge occurred longer than previously thought with heightened volcanism between 4-5 Ma. Recovered lavas range from picro-basalts (MgO = ~8 wt.%) to dacites with arc-type normalized incompatible element patterns and Sr and Pb isotopic compositions intermediate between Pacific MORB and subducted lithosphere. In addition, lavas from the Kermadec Ridge form two distinct groups with one being similar to the Colville Ridge lavas and the other being more similar to the present day Kermadec arc front lavas. The youngest lava of the Kermadec-Colville group is 4.41±0.35 Ma and the oldest Kermadec Ridge arc front group is 3.40±0.24 Ma suggesting that arc splitting and eastward movement of the Kermadec Ridge occurred between 4.4 and 3.4 Ma. Geochemically diverse lavas, including ocean island basalt-like and potassic lavas with high Ce/Yb, Th/Zr, intermediate $^{206}Pb/^{204}Pb$ and low $^{143}Nd/^{144}Nd$ ratios were recovered from the Oligocene South Fiji Basin (and Eocene Three Kings Ridge) located west of the Colville Ridge. Assuming that trench-perpendicular mantle flow was dominant during the Miocene, this heterogeneity was likely preserved in the proto-Kermadec sub-arc mantle. The new Colville and Kermadec Ridge data therefore provide the first robust constraints on the timing of proto-Kermadec arc splitting and highlights the complex interplay between mantle heterogeneities and material fluxes from the subducting Pacific Plate and how this tectonism influences volcanic activity along the Kermadec arc at the present.