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Crustal versus source processes on the North East volcanic rift zone of Tenerife, Canary Islands

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The North East Rift Zone (NERZ) on Tenerife is a well exposed example of a major ocean island volcanic rift. To gain insights into the petrologic evolution of the NERZ, and to unravel the isotopic characteristics of its mantle sources, we present major and trace element and O-Sr-Nd-Pb isotope analyses for dykes of the NERZ. Fractional crystallisation is the major process controlling major and trace element variability in the dykes. Variable degrees of low temperature alteration in combination with ca. 10-20 % assimilation of hydrothermally altered island edifice modified the primary δ18O and the Sr-Nd isotope composition of the dykes, but had little to no discernable effect on Pb isotopes. Minor sediment contamination, however, may have affected the Pb isotope composition of two samples plotting to high 207Pb/204Pb values. Subsequent to screening of the data for shallow level contamination, the underlying isotope systematics of the NERZ reflects a mixture principally of DMM and young HIMU-type mantle components. Trace element patterns are additionally consistent with a HIMU-dominated source. The 206Pb/204Pb–207Pb/204Pb isotope composition of the NERZ supports a model of initiation and growth of the rift from the Central Shield volcano (Roque del Conde) as has recently been proposed based on geochronology [1]. The similar isotope signature of the Miocene Central Shield, the Miocene-Pliocene NE rift and the Pliocene Las Cañadas central volcano suggests that the source feeding the central part of Tenerife Island was almost constant through the Miocene to Pliocene. This can be explained by the presence of a discrete blob of HIMU material, $\leq$ 100 km in vertical extent, occupying the melting zone beneath central Tenerife from the Miocene to Pliocene. Recent central magmatism on Tenerife probably reflects greater entrainment of DMM material, perhaps due to waning of the blob with time.

References

[1] Carracedo, Guillou, Nomade, Rodríguez Badiola, Paris, Troll, Wiesmaier, Delcamp & Fernández-Turiel (2010), Geological Society of America Bulletin (doi:10.1130/B30119.1).