

Insights from olivine oxygen isotope compositions into the mantle sources of picrites from the Karoo LIP

KIERAN A. ILES^{*1}, ARTO V. LUTTINEN¹, MARTIN J. WHITEHOUSE²

¹ Finnish Museum of Natural History, University of Helsinki, P.O. Box 64, 00014 Helsinki, Finland (*correspondence: kieran.iles@helsinki.fi)

² Department of Geosciences, Swedish Museum of Natural History, P.O. Box 50 077, 10405 Stockholm, Sweden

Continental flood basalts in the Karoo large igneous province (LIP) have been divided into low-Ti and high-Ti groups, with contributions from recycled crust to the mantle source region inferred for high-Ti picrites. Picrites from the Luenha river, Mozambique, represent a low-Ti end-member of the compositional diversity. Several geochemical characteristics (including $\epsilon\text{Nd}_{180\text{Ma}}$ -2.0 to +1.4 and strongly positive ΔNb) of the Luenha picrites suggest derivation from a source of primitive mantle affinity. However, despite bulk-rock geochemical indicators for a peridotite source lithology, olivine trace elements ratios suggest a minor contribution from pyroxenitic material in the source, representing possible recycling of oceanic crust into the mantle.

New O isotope data have been acquired on the NordSIM Cameca IMS 1280 ion microprobe for 4 samples with olivine varying from Fo₈₀ to Fo₈₉. Two samples with the largest range of olivine Fo exhibit relatively homogeneous $\delta^{18}\text{O}$ of ~6.5‰. In contrast, samples with the most forsteritic olivine (including the sample inferred to most closely represent the parental magma) have heterogeneous $\delta^{18}\text{O}$ compositions spanning the range 5.0-6.5 ‰. These data suggest contributions from two mantle sources in the genesis of the the Luenha picrites; one shows affinity to primitive mantle peridotite and the other has elevated $\delta^{18}\text{O}$ consistent with the involvement of recycled altered oceanic crust. Thus, as for the high-Ti group, recycling of crust into the mantle appears important in the origin of the low-Ti rocks of the Karoo LIP.