

Origin of the Kakanui Mineral Breccia Nephelinite and its Megacryst and Xenolith Suites

VAN DER MEER, Q.H.A.^{1,2,3} HARRIS, C.¹ LE ROUX, P.¹
HANSEN, S.² SCOTT, J.M.³ WAIGHT, T.E.²

¹ Department of Geological Sciences, University of Cape Town. *qvandermeer@gmail.com*

² Department of Geosciences and Natural Resource Management (Geology Section), Copenhagen University

³ Department of Geology, University of Otago

The ~34 Ma Kakanui Mineral Breccia (Hoernle et al., 2006) is part of a Zealandia-wide province of intraplate volcanism that has been active since the late Cretaceous. The erupted alkaline nephelinites are characterised by HIMU-like isotopic compositions common for low-silica intraplate lavas in the region. A remarkable feature however, is the abundance and variety of megacrysts and xenoliths transported to the surface during the explosive Surtseyan eruptions. Centimetre-decimetre sized megacrysts include kaersutite, augite, pyrope, orthoclase, apatite and phlogopite. Similarly sized xenoliths are dominated by garnet and/or amphibole bearing pyroxenite but also include spinel lherzolite and felsic granulite, together forming a highly varied and rare suite of rocks. The isotopic and trace elemental characterisation of this suite by modern methods is limited. Recent geochemical studies of the Kakanui Mineral Breccia have only targeted specific minerals (e.g. Hoernle et al., 2006; Fulmer et al., 2010) or xenoliths (e.g. Scott et al., 2014; McCoy-West et al., 2016) as a part of broader studies into Zealandia intraplate magmatism and lithospheric mantle compositions. Here, a comprehensive geochemical, stable and radiogenic isotope study with a focus on the entire suite is presented, allowing a detailed assessment of origin of the varied materials and their potential role in melt generation and evolution.

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