Os isotope evidence for a heterogeneous source for the world's largest Phanerozoic volcanic event

SCHAEFER, B. F.[1], HOERNLE, K.[2], PARKINSON, I. J.[3], GOLOWIN, R.[2], PORTNYAGIN, M.[2], TURNER, S. P.[1], HAUFF, F.[2] AND WERNER, R.[2]

[1]Earth and Planetary Sciences, Macquarie University, NSW Australia (*corresponence: Bruce.Schaefer@mq.edu.au)
[2]GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany
[3]School of Earth Sciences, Bristol University, UK

Previous Os isotopic investigations of lavas from the Ontong Java Plateau[1,2] observed that geographically widely dispersed samples of differing chemistries preserved an isochron of 123±8 Ma with an initial $^{187}Os/^{188}Os$ = 0.1289±0.0095. Here we present 12 new Re-Os isotopic analyses from the Manihiki Plateau, itself a portion of the greater Ontong Java Nui (OJN) magmatic event in order to explore the nature of the source of magmatism for the worlds largest Phanerozoic magmatic event. Samples were obtained by dredges and ROV from R/V SONNE 193 and 225 cruise legs, and were selected on the basis of freshness and Ni content.

In contrast to the OJP data which points towards a near-chondritic, primitive mantle source for both Kroenke and Kwambaita lavas, the low Ti Manihiki samples preserve $^{187}Os/^{188}Os_{(i)}$ ranging from 0.1056-0.1714. High Ti Manihiki samples preserve $^{187}Os/^{188}Os_{(i)}$ = 0.1094-0.1288. Such strongly subchondritic signatures require some component of recycled material in the mantle source, possibly SCLM (T_{RD} low Ti samples ~3.1Ga; and ~2.3-2.6Ga for the high Ti samples). Higher initial Os isotope ratios could indicate the presence of metasomatised lithosphere and/or lower crust.

In summary, the Ontong Java and Manihiki samples could conceivably contain mantle sourced from both an undifferentiated, near-chondritic source, as well as ancient, unradiogenic recycled sources. Thus the greater OJN province preserves evidence of sampling a heterogeneous source[2] containing both primitive and recycled components. It is probable that greater degress of partial melting beneath Ontong Java homogenised these heterogeneities, whereas more complex, multi stage melting processes near the plume margin at Manihiki allowed sampling of the inherent heterogeneities within the plume head.

[1] Parkinson et al., 2002, *GCA* **66**(**15A**) A580. [2] Tekada et al. *EPSL* 2013, **377-378**, p. 84-96