Borehole Volcanostratigraphy of the Central Kalkarindji CFBP, Australia

Peter MARSHALL[1], Mike WIDDOWSON[1], David MURPHY[2], Benjamin GRAY[2], Nathaniel CLARK[2,3]

[1]Dept. Environment, Earth & Ecosystems, The Open University, Walton Hall, Milton Keynes, UK. MK7 6AA; Email peter.marshall@open.ac.uk
[2]Biogeosciences, Queensland University of Technology, Brisbane, QLD 4000, Australia.
[3]Newcrest Mining Limited, 400 George Street, Brisbane, QLD 4000, Australia.

The Kalkarindji flood basalts are remnants of the world's most ancient CFBP, for which significant thicknesses of the lava succession still remain preserved. This 505-510 Ma LIP now consists of scattered basaltic suites across northern and central Australia, which together indicate a minimum eruptive volume of 1.5 x 10^5 km^3, though this may have been at least 5 times this size prior to erosion.

The western Waterloo region contains some of the best preserved and most extensive lava flows. Within this region, an area SE of Lake Argyle (c. 600 km^2), contains three boreholes sunk to depths of 200 - 300 m. Field reconnaissance reveals flow units to be thick (40 - 60 m) sheet-like aphanitic basalt with vesiculated or rubbly flow-tops. Each flow package is chemically distinct allowing for direct comparison between borehole stratigraphy and surface exposures, and the interpretation of palaeo-flow patterns across large distances. The general geochemical characteristics of the units indicate predominantly evolved, low Ti-tholeiitic basaltic andesites and basaltic trachy-andesites exhibiting extreme crustal contamination signatures. Therefore, composition of the Kalkarindji eruption is distinct from other, more typical, tholeiitic CFBP successions elsewhere.

We present new stratigraphical data of archive material from boreholes BMR Limbunya 1, BMR Waterloo 1, & BMR Waterloo 2, (drilled in 1971). Detailed inspection of core-chip material combined with detailed geochemistry provides a method for flow-unit identification and thus the basis for correlating over distances of c. 100 km. Comparisons between these logs reveal insights to both correlative stratigraphy and larger-scale eruption mechanics within this central region.