Petrogenesis of enriched MORB from the Macquarie Ridge Complex

*Chris Conway¹, Richard Wysoczanski², Alexander Nichols⁴, Joel Baker³, Helen Bostock²


The Macquarie Ridge Complex is an ideal site for examining magmatism at slow-spreading mid-ocean ridges due to the Miocene evolution from seafloor spreading to oblique convergence along the coincident Australia–Pacific plate boundary. We present whole-rock major and trace and glass volatile element data for volcanic samples collected from a 1200 km section of the extinct spreading ridge in order to investigate the dynamics of magma generation, ascent, and eruption in such settings. The sample suite can be divided into E-MORB lavas with moderate (La/SmN = 1.0–1.8) or high (La/SmN > 2.0) incompatible element enrichment. The latter type is consistent with being sourced from low-degree partial melts of enriched mantle domains. Furthermore, as indicated by their evolved geochemical compositions and CO₂ -H₂O systematics, the source magmas underwent fractionation and degassing during stalled ascents, possibly due to ultraslow seafloor spreading rates.

Keywords: mid-ocean ridge basalt, petrogenesis, Macquarie Ridge Complex, E-MORB