# The Origin of Researcher Ridge (Central Atlantic Ocean)

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Researcher Ridge (RR) is a 400 km long, WNW-ESE oriented chain of single and coalescent volcanic structures located on 20 to 40 Ma old oceanic crust on the western flank of the Mid-Atlantic Ridge (MAR) at ~14°N. The origin of RR is completely unclear. Proposed models for its formation range from purely plate-tectonic driven, shallow processes (e.g., resulting from migration of a triple junction, Roest and Collette, 1986) to upwelling of a chemical heterogeneity in the upper mantle (as proposed for the South Mid-Atlantic Ridge between the Ascension and Bode Verde Fracture Zones; Hoernle et al., 2011) to involvement of a deep mantle plume. Mid-ocean ridge basalts (MORB) sampled along the MAR axis in this area reveal an unusual geochemical anomaly. At the latitude where the RR axis projects to the MAR at 14°-15° N, the ridge axis is bathymetrically elevated and characterized by geochemically enriched basalt, so called Enriched-MORB (E-MORB) (Bonatti et al., 1992; Hémond et al., 2006), suggesting a possible relationship of the geochemical/melting anomaly of the MAR and RR formation. In this study, we combine $^{40}Ar/^{39}Ar$ age dating with petrological and geochemical (trace element and Sr, Nd, and Pb double spike isotope analyses) studies of volcanic rocks dredged along an E-W profile of the RR during expedition POSEIDON 379/2 to reveal its elusive origin. Preliminary results show that RR lavas underwent high-pressure fractionation (with clinopyroxene as dominant phase), pointing towards deeper fractionation than normally occurring in MORBs. The depletion of heavy rare Earth elements (HREE) and the negative slope of the HREE on multi-element diagrams and the enrichment of incompatible versus less incompatible trace elements in RR lavas both indicate lower degrees of melting and at deeper depth (garnet stability field) than MORBs. The isotopic composition of the lavas, however, largely overlaps with North Atlantic MORB, but the samples form a distinct trend towards the global HIMU (high-μ = high time-integrated $^{238}U/^{204}Pb$) mantle end member.

## References

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