

Is hot spot magmatism, like Hawaii, coming from shallow mantle?

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Earth's magmatism occurs primarily at hot spots (Hawaii), subduction zones (convergent margins like Japan) and mid-ocean ridges (divergent margins like the Mid-Atlantic Ridge). In all these cases the Earth's mantle partially melts to generate magma. The isotope geochemistry of the magmas, and hence the source of the magma, erupting at mid-ocean ridges (MORs) is distinct from those of hot spots. Currently two different models explain the origin of these magmas. This study proposes a test (of the Anderson model) by comparing the geochemistry of the magmas with a plate motion parameter that should correlate with the depth of the source mantle.

We have looked for a possible relationship between the absolute migration speed of MORs and the radiogenic isotope geochemistry of MOR basalt (MORB). A positive correlation between ridge migration velocity and degree of isotopic enrichment in MORB may bolster the idea of a global, shallow, buoyant, enriched mantle reservoir, because more rapidly migrating ridges should tap shallower mantle. Preliminary results show no strong correlation between present ridge migration rates and the radiogenic isotope composition of MORB. However, the global MORB database is ever expanding and more data points are becoming available. Also, there are other reference frames for calculating migration rates that might be explored. It is our intention to retrieve more data for analysis and use other reference frames to determine whether a global, shallow, buoyant, enriched mantle reservoir exists.