Tracing the long-lived rurutu mantle source in the Pacific with implications for plume motions

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In the Pacific Ocean there exist only two primary hotspot trials (Hawaii and Louisville) that can be traced with a high degree of confidence back to at least 75 Ma. Both hotspot trails are continuous in their morphology, show systematic age progressions and have exhibited independent plume motions over their long histories. All other hotspot trails in the Pacific are rather short, typically containing no more than 30 Myr of hotspot volcanism. However, assuming that hotspots “wax and wane” in melt production and their related volcano construction, we may be able to trace other long-lived mantle sources in the Pacific by “linking” shorter, discontinuous hotspot segments.

Here we present the first $^{40}Ar/^{39}Ar$ incremental heating ages from two comprehensive studies on the Rurutu hotspot. The first study focuses on the Tuvalu seamount trail, which ranges from 40 to 70 Ma in age; the second study focuses on the segment of the Rurutu hotspot in the Cook-Austral Islands that is younger than 22 Ma. Tuvalu samples are new dredge samples collected with the R/V Roger Revelle during expedition RR1310 in 2013; the Cook-Austral Islands project focused on the redating of subaerial basalts previously dated using conventional K/Ar techniques (Duncan & Mcdougall 1976; Turner & Jarrard 1982). For both projects, plagioclase, hornblende and groundmass samples were analyzed using the ARGUS-VI multi-collector noble gas mass spectrometer and by applying detailed incremental heating experiments.

Combined with a high $^{206}Pb/^{204}Pb$ signature − suggesting magmas in Tuvalu and the Cook-Australs all derived from distinctive HIMU mantle sources − our first results show that we can add Rurutu to the short list of long-lived (>75 Ma) hotspots in the Pacific. Secondly, in a similar fashion as Louisville and Hawaii, we can show that the Rurutu plume has been moving independently of each other over the last 70 millions of years.