The geochemical evolution of oceanic intraplate volcanoes

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Most oceanic intraplate volcanoes show temporal and spatial major and trace element changes of magma compositions over time scales of 1-2 Myr. The geochemical evolution of volcanism along the Hawaiian-Emperor Chain is relatively well known from analysis of drilled and dredged sample material (e.g. [1] [2]). In Hawaii the preshield, shield, postshield and rejuvenated stage are geochemically distinct. According to the plate tectonic and deep mantle plume model, these stages are believed to reflect variations in the extent of partial melting and plume-asthenosphere/lithosphere mixing, depending on the relative positioning of the plume centre to the overriding lithosphere. Therefore, all oceanic intraplate volcanoes formed above a mantle plume should follow these patterns but, to date, only a few volcanoes have been studied systematically with respect to their magmatic evolution.

Here we present a compilation of published chemical data from shield and postshield lavas from well-studied volcanoes from the Hawaii, Louisville, Society, Austral, Marquesas, and Samoa volcanic chains, to compare their evolutionary paths. First results show that the duration of volcanic activity varies considerably between 1 and 2 Myr but is generally on the order of 1.2 Myr. Both Hawaiian and Tahiti volcanoes show a decrease in SiO_2 with decreasing age, which is in good agreement with a continuous transition from tholeiitic shield to alkaline postshield stage magmas. Lava compositions of the studied volcanoes vary but systematic correlations are observed in SiO_2 contents and rare earth element enrichment, reflecting variable degree and depth of melting. Tahiti lavas show higher $(Ce/Yb)_N$ for a given SiO_2 content compared to the Hawaii and Louisville lavas. This variation is probably due to lower degrees of partial melting at Tahiti compared to the Hawaiian and Louisville volcanoes, which does not necessarily result from changes in the lithospheric age and thickness but may rather reflect variable temperature of the mantle source. With this study, we aim to contribute to the systematic major and trace element changes in oceanic intraplate volcanoes and test how representative intraplate melts are for their mantle sources and underlying lithosphere.

[1] Regelous et al. (2003). *J. Petrol.* **44**, 113-140. [2] Reiners and Nelson (1998). *GCA* **62**, 2347-2368.