Geophysical Research Abstracts, Vol. 8, 04096, 2006
SRef-ID:

Lithospheric control of widespread Galapagos hotspot volcanism

J. O'Connor (1), P. Stoffers (2), J. Wijbrans (1), T. Worthington (2)

(1) Department of Isotope Geochemistry, Vrije University Amsterdam, The Netherlands, (2) Institute for Geosciences, Christian-Albrechts-University, Kiel, Germany

More than 30 years after being first proposed the mantle plume paradigm (Morgan 1972) remains the only viable explanation for time-progressive volcanism along seamount chains and aseismic ridges. The Galapagos Archipelago is the focus of many studies that have an influence on the current debate about the existence of mantle plumes. However, the volcanically very active Galapagos Islands constitute only a small part of the much larger Galapagos Volcanic Province (GVP) consisting of the Cocos, Carnegie, Coiba and Malpelo aseismic ridges and their associated seamounts. Although these aseismic ridges and seamounts dominate the morphology of the region, very little is known about their origin due to a lack of direct age and geochemical information. Therefore, we undertook the first systematic dredge sampling of the submerged regions of the GVP during the 1999 RV SONNE PAGANINI expedition. Correlating new $^{40}Ar/^{39}Ar$ ages with sample-site distance from the western edge of the Galapagos Islands suggests that volcanism has not progressed in the form of narrow time-progressive lines on the Cocos and Nazca plates as predicted by the mantle plume paradigm. Rather, we observe a time-progressive trend in broad regions of concurrent dispersed volcanism. Such widespread volcanism suggests the possibility of a correspondingly large Galapagos hotspot melting anomaly. Development of the GVP via Cocos and Nazca plate divergence and migration over a much broader hotspot anomaly than currently envisioned would also explain multiple phases of volcanism over millions of years evident across the GVP. We suggest that information about the role of lithosphere-scale processes in such comparatively simple oceanic analogs can help resolve the more complex evolution of continental topography.