

Past plate and mantle motion from new ages for the Hawaiian-Emperor Seamount Chain

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Estimates of the relative motion between the Hawaiian and Louisville hotspots have consequences for understanding the role and character of deep Pacific-mantle return flow. The relative motion between these primary hotspots can be inferred by comparing the age records for their seamount trails. Our new ⁴⁰Ar/³⁹Ar ages for 18 lavas from 10 seamounts along the Hawaiian-Emperor Seamount Chain (HESC) show that volcanism started in the sharp portion of the Hawaiian-Emperor Bend (HEB) at ≥ 47.5 Ma and continued for ≥ 5 Myr [1]. The slope of the along-track distance from the currently active Hawaiian hotspot plotted versus age is remarkably linear between ~ 57 and 25 Ma in the central ~ 1900 km of the seamount chain, including the HEB. This model predicts an age for the oldest Emperor Seamounts that matches published ages, implying that a linear age-distance relationship might extend back to at least 82 Ma. In contrast, Hawaiian age progression was much faster since at least ~ 15 Ma and possibly as early as ~ 27 Ma. Linear age-distance relations for the Hawaii-Emperor and Louisville seamount chains predict ~ 300 km overall hotspot relative motion between 80 and 47.5 Ma, in broad agreement with numerical models of plumes in a convecting mantle, and paleomagnetic data. We show that a change in hotspot relative motion may also have occurred between ~ 55 Ma and ~ 50 Ma. We interpret this changing in hotspot motion as evidence that the HEB reflects a combination of hotspot and plate motion changes driven by the same plate/mantle reorganization.

[1] O'Connor *et al* (2013), *Geochem. Geophys. Geosyst.* **14**, 4564–4584