Large-scale motion between hotspots

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Plate reconstructions using a fixed hotspot reference frame have had a tremendous impact on how we view the geological processes that have shaped Earth. Some 30 years after its introduction, however, the basic assumption behind the reference frame — that hotspots are fixed relative to the deep mantle — remains contentious. Drilling of submerged Mesozoic flat-topped volcanoes ("guyots") in the Pacific has given us the opportunity to address this long-standing question. Paleomagnetic data from basalts and sediments recovered at these guyots have enabled us to construct a record of paleolatitude versus time. For a long period during the Cretaceous (129-95 Ma) Pacific plate experienced little, if any, latitudinal translation [*Tarduno and Sager,* 1995].

Global paleomagnetic data, when rotated into the hotspot reference frame, present a different view. These continental data have been used to define a true polar wander (TPW) episode in which the entire solid Earth rotated with respect to the spin axis.

Because no latitudinal motion is seen in the new Pacific data, TPW can be confidently excluded. But the global paleomagnetic data on which TPW was defined are sound. The remaining alternative explanation is that the Atlantic hotspots which define the Cretaceous hotspot frame, specifically New England (NE) and Tristan (T), were moving relative to hotspots in the Pacific (Ra, Me, Ru, P). At approximately 30 mm/yr S (figure), the rate of motion is 50% larger than that postulated previously for any hotspot [*Tarduno and Gee,* 1995]. This rapid motion occurred while the massive Ontong Java [*Tarduno et al.,* 1991] and Kerguelen large igneous provinces (L and K, figure) formed. Elucidating how these phenomena are related and whether hotspots moved at comparable rates during other times are challenges for future research.

References
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