

On the Relationship Between Volcanic Hotspot Locations, the Reconstructed Eruption Sites of Large Igneous Provinces and Deep Mantle Seismic Structure.

GOES, S.¹, DAVIES, D.R.² AND SAMBRIDGE, M.²

¹Department of Earth Science & Engineering,
Imperial College London, London, UK.

²Research School of Earth Sciences, The Australian
National University, Canberra, Australia.
Rhodri.Davies@anu.edu.au

It has been proposed that volcanic hotspots and the reconstructed eruption sites of large igneous provinces (LIPs) are preferentially located above the margins of two deep mantle large low shear-wave velocity provinces (LLSVPs), beneath the African continent and the Pacific Ocean. This spatial correlation has been interpreted to imply that LLSVPs represent long-lived, dense, stable thermochemical piles, which preferentially trigger mantle plumes at their edges and exert a strong influence on lower-mantle dynamics. Here, we re-analyse this spatial correlation, demonstrating that it is not global: it is strong for the African LLSVP, but weak for the Pacific. Moreover, Monte-Carlo based statistical analyses indicate that the observed distribution of African and Pacific hotspots/reconstructed LIPs are consistent with the hypothesis that they are drawn from a sample that is uniformly distributed across the entire areal extent of each LLSVP: the stronger spatial correlation with the margin of the African LLSVP is expected as a simple consequence of its elongated geometry, where greater than 75% of the LLSVP interior lies within 10° of its margin. Our results imply that the geographical distribution of hotspots and reconstructed LIPs does not indicate the extent to which chemical heterogeneity influences lower-mantle dynamics.