Dynamics of mantle plumes: understanding the formation of hotspot tracks

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The intraplate volcanism such as hotspots are observed on Earth’s surface. Hotspots sometimes form into age-progressive island chains. Although variable mechanisms have been proposed to account for the origin of hotspots, a deep mantle plume origin is widely accepted for some hotspots, such as the Hawaii. Studies in the early 60’s and 70’s showed that the Pacific hotspot tracks can be produced by moving a rigid plate above a stationary mantle plume. The fixed plumes thus provide a reference frame to reconstruct the absolute plate motion. However, as a mantle plume rises from the deepest mantle toward the surface, it is inevitably affected by the background mantle flows and is expected to move laterally. In this talk, I will first introduce to you how people previously understand the fixity of mantle plumes. I will then show how geodynamic modeling helps understand the dynamics of mantle plumes and the formation of hotspot tracks.