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Predicted path for hotspot tracks off South America since Paleocene times: tectonic implications of ridge-trench collision along the Andean margin

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Abstract

Hotspots are generated by partial melting due to hot plumes rising within the Earth's mantle, and when tectonic plates move relative to the plume source, hotspot tracks form. Off South America, the oceanic Nazca Plate hosts a large population of hotspot tracks. Examples include seamounts formed far from the Pacific-Nazca spreading center (*"off-ridge"* seamounts), such as the Juan Fernández Ridge (Juan Fernández hotspot), the Taltal Ridge (San Félix hotspot), and the Copiapó Ridge (Caldera hotspot). These hotspot tracks are characterized by a rough and discontinuous topography. Other examples include seamounts formed near the East Pacific Rise (EPR) (*"on-ridge"* seamounts), such as the Nazca Ridge (Easter Island hotspot) and Easter Seamount Chain (Sala y Gómez hotspot), and the Iquique Ridge (Foundation hotspot). These oceanic ridges developed a relatively smooth and broad morphology. Here, we present a plate reconstruction of these six oceanic hotspot tracks since the Paleocene, providing a kinematic model of ridge-continental margin collision. For the "*off-ridge"* seamount group, the plate kinematic reconstruction indicates that the collision point remained quasi-stationary from 40 to 30-25 Ma. Eventually, the southward migration of the collision point of this seamount group accelerated from 23 to 15 Ma (reaching a maxima speed of 300 km/Ma along the trench). From 15 Ma to present the collision point has remained quasi-stationary. The predicted location of the subducted portion of the Taltal, Copiapó and Juan Fernández Ridges coincides with the southward migrating (relative to South America) flat slab segment. For the "*on-ridge"* seamount group,