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Partitioning of oblique convergence in the Northern Andes subduction zone: Migration history and the present-day boundary of the North Andean Sliver in Ecuador

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Abstract

Along the Ecuadorian margin, oblique subduction induces deformation of the overriding continental plate. For the last 15 Ma, both exhumation and tectonic history of Ecuador suggest that the northeastward motion of the North Andean Sliver (NAS) was accompanied by an eastward migration of its eastern boundary and successive progressively narrowing restraining bends. Here we present geologic data, earthquake epicenters, focal mechanisms, GPS results, and a revised active fault map consistent with this new kinematic model. All data sets concur to demonstrate that active continental deformation is presently localized along a single major fault system, connecting fault segments from the Gulf of Guayaquil to the eastern Andean Cordillera. Although secondary faults are recognized within the Cordillera, they accommodate a negligible fraction of relative motion compared to the main fault system. The eastern limit is then concentrated rather than distributed as first proposed, marking a sharp boundary between the NAS, the Inca sliver, and the Subandean domain overthrusting the South American craton. The NAS limit follows a northeast striking right-lateral transpressional strike-slip system from the Gulf of Guayaquil (Isla Puná) to the Andean Cordillera and with the north-south striking transpressive faults along the eastern Andes. Eastward migration of the restraining belt since the Pliocene, abandonment of the sutures and reactivation of north-south striking ancient fault zones lead to the final development of a major tectonic boundary south and east of the NAS, favoring its extrusion as a continental sliver, accommodating the oblique convergence of the Nazca oceanic plate toward South America.

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