

Clues on the Cenozoic orogenic growth of Southernmost Colombian Andes

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The temporal and tectonic evolution of the southernmost segment of the Colombian Andes has been limitedly explored due to historical access difficulties, which have precluded a precise evaluation of regional versus local tectonic controls on the orogenic growth following the major Late Cretaceous to Paleocene arc-continent collisional event that marked the onset of the north-Andean orogeny.

In this contribution we review new and published field, provenance, geochronological, thermochronological and botanical constraints in order to assess the post-Paleocene tectonic regimes that shaped the southern segment of the Colombian Andes. There, a major environmental and provenance change is recorded by middle to late Eocene sequences of the sub-Andean region of Putumayo, marked by high-energy fluvial conglomerates and sandstones that replaced the Paleocene coastal and deltaic environments. The Eocene sandstones are highly immature including igneous, metamorphic and sedimentary lithics, which contrast with the more quartzose character of the older formations. The presence of Late Cretaceous detrital zircon U-Pb ages and the lithic-rich composition suggest westerly derived sources strongly different from the currently exposed Jurassic magmatic rocks in adjacent mountainous region.

The middle Eocene to late Oligocene magmatic record seems to be limited to almost absent, whereas in the early Miocene, the magmatic activity resumed as evidenced in the presence of small size stocks that intrude deformed Late Cretaceous to early Paleogene turbiditic units in the west. The evolution of the magmatic arc during the Miocene is marked by a significant eastward migration, followed by the occurrence of a major ignimbritic event during the Pliocene that covered a vast area of southern Colombia. Thermochronological and structural constraints suggest that the exposed Jurassic basement, immediately adjacent to the sub-Andean region, thrust over the Eocene and the Oligocene-Miocene sediments and records a Late Miocene fast cooling episode. Molecular data from high-elevation palm assemblages also suggest that by 7.7-5.6 Ma considerable elevations were already gained in the southernmost Colombian Andes?

It is therefore arguable the existence of at least two major episodes of orogenic paroxysm in the southern segment of the Colombian Andes. Whereas the eastward arc migration and the subsequent magmatic flare-up, together with inland migration of the deformational front and uplift during the late Miocene-Pliocene may be attributed to changes in the subduction angle, the triggering mechanisms for the older Eocene event is less clear. However, the increased orthogonality and rate of convergence between the South-American and Farallon plates may account for enhanced stress due to high plate coupling causing the upper-plate deformational event.