



Cenozoic exhumation patterns in the Southern Colombian Andes: Their Sedimentary Record on the Foreland Putumayo Basin

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Abstract:

The uplift and early exhumation of orogens can be investigated using the sedimentary provenance of adjacent foreland basins. Cenozoic exhumation and uplift of the northern Andes and the concurrent formation of the flexural Putumayo Basin to the east allow using its sedimentary record to investigate the modes of Andean exhumation. We carried out multiproxy provenance analyses of Cretaceous and Cenozoic sedimentary rocks that crop out along the southern foothills of the Eastern Cordillera of Colombia. The detrital zircon U/Pb age distributions suggest abrupt provenance shifts among Upper Cretaceous sedimentary marine units (ie. Caballos and Villeta formations), the Maastrichtian-Paleocene transitional Rumiyaco Formation, and the Eocene-Miocene continental units (ie. Pepino Formation and Orito Group). Whereas the Cretaceous rocks were derived from the Amazonian cratonic areas and the Mesoproterozoic basement underlying the Putumayo foredeep, the Cenozoic rocks were fed with detrital zircons reworked from the Cretaceous rocks from the uplifting Eastern Cordillera. Conglomerate clast counting and petrographic analyses show a change from high quartz contents at the bottom of Rumiyaco Formation to a high sedimentary and volcanic lithics content for Pepino Formation. The Orito Group has a renewed contribution of quartz minerals in their composition.

The compositional variations in sandstones and conglomerates from Cenozoic units allow tracking unroofing associated with inversion of ancient normal faults formed during the Jurassic and Lower Cretaceous back-arc basin. Tectonic inversion triggered the erosion of compositionally mature marine Cretaceous cover and occasionally igneous and low-grade metamorphic basement, which are unroofed and eroded during the Cenozoic. The provenance analysis suggests an onset of the northern Andes exhumation during the late Cretaceous, further enhanced during the deposition of the Eocene Pepino Formation. New and published low thermochronometric data show that the Jurassic basement was exhumed at low and monotonic rate since the Miocene before a faster Pliocene exhumation. Our results show earlier exhumation than previously estimated for the northern Colombian Andes and are compatible with previous studies from the Oriente Basin in the Ecuadorian Andes.