Sedimentary basin evolution and structural compartmentalization in the northernmost Andes: Eastern Cordillera and Magdalena Valley, Colombia

Natthakorn Konguthaithip*, Jackson School of Geosciences, The University of Texas at Austin Brian K. Horton, Jackson School of Geosciences, The University of Texas at Austin Mauricio Parra, Institute of Geosciences, University of São Paulo Richard A. Ketcham, Jackson School of Geosciences, The University of Texas at Austin Matthew A. Malkowski, Jackson School of Geosciences, The University of Texas at Austin *Corresponding author: konguthaithip@utexas.edu

Abstract

Topographic development of the northernmost Andes is recorded in Mesozoic-Cenozoic clastic basin fill along the Middle Magdalena Valley and Eastern Cordillera fold-thrust belt of Colombia. Along the Magdalena Valley-Eastern Cordillera boundary, the Volador study area (5.5-6.0°N) displays structures that pre-date and post-date an important regional unconformity of Eocene age. The contrasting sedimentary successions above and below the unconformity define a major shift from organic-rich clastic marine deposition of regional extent to more localized coarse-grained fluvial and alluvial fan deposition with significant lateral variations. New detrital zircon U-Pb geochronological data across the unconformity reveal stepwise provenance changes in response to the transition from post-extensional (thermal) to early foreland basin (flexural) subsidence. The latest Cretaceous to early Paleocene shift from Andean basement and cratonic sources (eastern provenance) to principally Andean magmatic arc sources (western provenance) recorded the onset of shortening and basin segmentation associated with igneous activity in the Central Cordillera magmatic arc during initial Andean uplift. Vitrinite reflectance (VR) results also suggest variations in topography and sediment burial across fault-bounded Paleocene units before and during unconformity development and fault-related folding. The maximum depositional age values from U-Pb age distributions across the unconformity are consistent with a ca. 10-15 Myr hiatus of roughly late Paleocene to middle Eocene age. This provides constraints for timing and structural modeling of shortening and basin inversion during initial uplift in the Eastern Cordillera. Integration of detrital zircon U-Pb geochronology and vitrinite reflectance data with structural and stratigraphic evidence indicates Mesozoic extension and post-extensional subsidence followed by early Cenozoic basin inversion during early Andean orogenesis. Further structural analyses will assess the kinematic sequence of deformation to identify linkages between uplift and sediment dispersal across the Middle Magdalena Valley and flanking Eastern Cordillera and Central Cordillera during Andean topographic development with attention to the role of stratigraphic and structural inheritance.

Keywords: Andes, basin, Colombia, foreland, tectonics

Advisor's signature

Bur Hat

Brian Horton