Sediment dispersal and source-to-sink dynamics in active river systems of the Ecuadorian Andes and foreland basin

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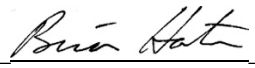
ABSTRACT

Sediment provenance analyses of active river systems provide insights into the propagation of detrital signatures from source to sink. The Ecuadorian Andes are a prime region to examine source-to-sink dynamics due to the spatial segregation of distinct igneous, metamorphic, and sedimentary units with diagnostic age populations. Major geologic units include Cenozoic volcanic rocks, Cretaceous sedimentary rocks, Triassic-Jurassic igneous intrusions, and Paleozoic metasedimentary rocks. In this study, detrital zircon U-Pb geochronological analyses of modern river sediments derived from source catchments with contrasting bedrock units offer opportunities to test the fidelity of U-Pb age signatures in discriminating tectonic provenance and downstream propagation of unit source signals.

In Ecuador, many questions remain regarding the transmission of bedrock source signals from the modern Andes to river systems that flow into the foreland basin and ultimately the Amazon River. The geologic framework of the Ecuadorian Andes includes: (1) the Western Cordillera, an active volcanic arc; (2) the Interandean Valley, containing Cenozoic volcaniclastic sedimentary rocks; (3) the Eastern Cordillera, comprised of Paleozoic metamorphic rocks and Triassic-Jurassic granitic batholiths; (4) the Subandean Zone, which features faulted Cretaceous sedimentary rocks; and (5) the Oriente Basin, a foreland basin composed of Cretaceous to Quaternary clastic deposits. This study integrates detrital zircon U-Pb geochronological results for 38 river sediment samples from the Napo, Aguarico, Santiago, and Pastaza rivers over a large region (~80,000 km^2) spanning the retroarc Andean fold-thrust belt and Oriente Basin of Ecuador. I compare U-Pb age populations from river samples to exposed geologic units in their corresponding drainage catchments to determine the degree to which modern rivers represent the variable distribution of geologic source units in different watersheds. I also assess the U-Pb age signatures along individual rivers to track downstream variations in age populations, including the introduction of new source units and the elimination, through dilution, of minor source signals. By examining these relationships, I pinpoint the origin of several U-Pb age signatures that can be linked to specific source units of the Ecuadorian Andes and ultimately may be tracked downstream to sediment sinks within the Amazon River and Amazon Fan.

Supervisor Signature 

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