DETRITAL ZIRCON PROVENANCE OF RETROARC OROGENIC SYSTEMS: MODERN RIVERS IN THE ANDEAN FORELAND OF WESTERN ARGENTINA

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ABSTRACT

Sediment provenance studies remain a fundamental tool in reconstructing tectonic, paleogeographic, and paleodrainage histories. Detrital zircon U-Pb age distributions have become increasingly utilized to identify sediment source regions and provide robust constraints on sediment provenance, depositional ages, and magmatic activity in the ancient rock record. Interpretations of detrital zircon result, however, involve many unknowns and common assumptions relating to: identification of potential sources; zircon source fertility; proximal-to-distal mixing effects; the range of possible erosion and drainage patterns; and patterns of sediment recycling. Moreover, despite the clear emphasis of detrital zircon research on major contractional orogenic belts, absent from most modern detrital zircon studies are considerations of the important differences in source signatures across the broad range of contrasting basin configurations. I propose to evaluate the ability of highly popular detrital zircon (DZ) U-Pb geochronological methods to accurately record the distribution of source units across a modern contractional orogen. By exploring whether (a) measured DZ age distributions reliably reflect source-rock exposure areas or (b) if disproportionate DZ contributions (due to variable zircon fertility, erodibility, or signal dilution) lead to uneven age distributions. Hypothetical influences on provenance signatures across the four major basin systems spanning a contractional orogen include: Hinterland basins influenced by greater zircon fertility of hinterland crystalline basement rocks. Wedge-top basins in fold-thrust systems are impacted by high erodibility of recycled synorogenic basin fill. Foredeep basins with major fluvial megafans have limited effects on zircon provenance. Broken foreland basins consist of isolated basement-cored uplifts that disrupt river provenance causing up-stream signal dilution. The proposed work includes sampling for detrital zircon U-Pb geochronology among diagnostic bedrock sources, major rivers, and minor tributaries in various basin settings throughout Andean study region in west-central Argentina (27-34˚S). Derive the relative Zr concentrations (fertility) among bedrock lithologies using standard geochemical analysis and grain counting. Quantify compressive rock strength values measured with a Schmidt Hammer on bedrock outcrops to constrain relative (erodibility) of sediment sources. Bedrock sediment sources zircon ages and fertility, erodibility, and surface area will be implemented into a predictive forward model to compare to the river and tributary datasets.

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