

Sediment mixing in a tropical foreland: Multisample comparison of detrital U-Pb distributions

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The ubiquity of zircon in sedimentary rocks due to high resistance to weathering makes detrital zircon (DZ) U-Pb an ideal provenance tracer and stratigraphic correlation tool in humid tropical areas, where chemical weathering precludes the preservation of alternative markers like instable lithic fragments over long distances. We employ DZ U-Pb geochronometry in 25 river-bar sand samples collected over ~900 km in five rivers of the Orinoco watershed, in the modern foredeep area of North Andes in Colombia in order to evaluate (1) sediment production and erosion in source areas and (2) resolution for stratigraphic correlations. We use Q-Q plots and the Kolmogorov-Smirnov statistic and multidimensional scaling (MDS) to quantitatively evaluate the similarity among samples, and with synthetic U-Pb signatures constructed using bedrock distributions in the source areas. MDS successfully characterizes dissimilarity among samples, which result from lithologic variability in the catchment area and distance of sediment transport. A fair correlation exists between the signatures of the synthetic source area and the river samples for three different catchments, indicating homogeneous sediment production and mixing. Our data show that the U-Pb distributions are preserved over distances of up to ~800 km in longitudinal rivers with gigantic drainage areas, where sediment mixing has occurred, as well as in transversal drainages with large areas (>3000 km²). Conversely, transversal drainages with smaller drainage areas and little lithological variation exhibit indistinguishable age distributions only until its confluence with a major longitudinal river.