Factors influencing the composition of detrital heavy mineral suites in Holocene sands of the Apure River drainage basin, Venezuela

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ABSTRACT

Heavy mineral assemblages in rivers in the Apure River drainage basin of Venezuela and Colombia closely reflect the nature of the source regions, which lie in the Andean orogenic terranes to the west and northwest . The Caribbean Mountains, largely composed of greenschist-facies pelites, phyllites, carbonates and metavolcanics, supply assemblages dominated by epidote and calcic amphibole. Minor amounts of the high-pressure index minerals glaucophane and lawsonite indicate the presence of blueschist-facies rocks, reflecting the origin of the Caribbean Mountains by subduction-related tectonism. The northern Mérida Andes, which comprise basement gneisses and granites overlain by unmetamorphosed to low-grade metamorphosed clastics, supply two types of assemblage reflecting these two lithological types: garnet-sillimanite-staurolite-amphibole suites from the basement rocks, and epidote-amphibole suites from the overlying cover sequence. The southern Mérida Andes supply stable heavy mineral suites reflecting recycling from the extensive unmetamorphosed sandstones that occur at outcrop. By considering suites from different physiographic provinces, the effects of short-term alluvial storage in the Llanos on heavy mineral assemblages has been evaluated. Weathering during alluvial storage appears to be effective in modifying the apatite-tourmaline ratio, which shows a steady, marked decline with distance from the mountain front, resulting from removal of apatite during weathering. Clinopyroxene and garnet may also show evidence of loss through weathering, although the trends are poorly constrained statistically. Epidote and amphibole proportions remain essentially constant, possibly through a balance between loss through weathering and continual re-supply from breakdown of rock fragments. In general, the heavy mineral assemblages are less affected by alluvial storage on the Llanos than the bulk mineralogy.