CaO and Na2O contents are both <1 wt%. All Al2O3/(Na2O+CaO) ratios are >8, suggesting depletion of CaO and Na2O during diagenesis or source weathering. Harker diagrams show negative correlation between Al2O3 and SiO2, and positive correlations of varying strength between Al2O3 and the other major oxides, possibly as a response to differences in clay mineralogy. As with most major elements, positive correlations exist between Al2O3 and Rb, Ba, Sr, Cr, Sc, Nb, Th, and Ga, reflecting control by clay content. Marked depletion in CaO (0.1-0.49 times) and Na2O (0.01-0.49 x) and extreme enrichment of Cr (up to 8.6 x) and V (up to 70 x) with respect to average upper continental crust (UCC) are the most characteristic features of these samples.

The chemical index of alteration (CIA) is well established as a method of quantifying the degree of weathering of sediments or their sources. CIA ratios for the Paja Formation samples are uniformly high, ranging from 76 to 98, significantly greater than published values for average shales. These features suggest the Paja shales were derived from an intensely weathered source, most probably under humid tropical conditions. The general trend in A-CN-K compositional space also points to a felsic source near the composition of UCC. Relatively high SiO 2 contents and high SiO 2/MgO ratios (10- 42) also support the concept of a predominantly felsic source.

Published geochemical diagrams for discriminating sources and tectonic setting of sediments ha ve also been applied to the Paja data. An overall felsic-recycled source is supported by major element discriminant functions aimed at determining provenance type. Although some scatter is observed, this does not necessarily reflect derivation from diverse sources, but may result from the effects of weathering and diagenesis. A felsic source is also indicated by immobile trace element ratios. Average Th/Sc and Zr/Sc ratios (0.98 and 13.4, respectively) lie close to those of UCC. Zr/Sc values also range to higher values (maximum 46), suggestive of recycling and zircon concentration. Bivariate SiO 2 - K2O/Na2O relations suggest the Paja Formation was deposited in a passive margin typesetting, even though K2O/Na2O ratios have likely been increased by post-depositional Kmetasomatism.

The above results suggest the Paja Formation shales are highly mature sediments recycled from deeply weathered older sedimentary or metasedimentary rocks, possibly the Guyana Shield, as proposed in previous work.

TECTONOMAGMATIC EVOLUTION OF THE NORTHERN PART OF THE CENTRAL CORDILLERA OF COLOMBIA USING Ar-Ar AND U-Pb SHRIMP METHODOLOGIES

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The northern part of the Central Cordillera has been described as a suspect terrain affected by several tectonometamorphic episodes. Some of them have been considered as related to the Hercynian orogeny, in Devonian and Carboniferous times; some other in the Upper Triassic; some thermal episodes were recorded during lower and upper Cretaceous, and other occur at the beginning of the Andean Cycle in cenozoic times. An early paleozoic and even precambrian age for the basement of the terrain has also been proposed.

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10 Ar-Ar analyses by the step heating technique and 3 U-Pb SHRIMP determinations in zircons were performed for igneous and metamorphic rocks from a wide shear zone corresponding to the Romeral Fault System in the Central Cordillera of Colombia. Amphibolites of the El Retiro group yielded Ar-Ar amphibole plateau ages about of 230 Ma, considered as metamorphic ages. The gneiss of Abejorral yielded an Ar-Ar biotite pseudo plateau cooling age of 230 Ma, and a permian U-Pb zircon age of about 280-300 Ma, interpreted as a reliable metamorphic age. It records inheritance at 500, 700 and between 920 - 1100 Ma. The La Honda Stock yielded biotite plateau ages of 218 Ma, the El Buey Stock yielded muscovite plateau ages of 219 Ma, the Monzodiorite of Horizontes yielded muscovite plateau ages of 207 and 212 Ma, interpreted as cooling ages related to intrusion. The stock of Amagá yielded a U-Pb zircon crystallization age of about 227 Ma, interpreted as a reliable crystallization age. In addition, it showed relict ages between 515 and 983 Ma of unknown derivation. The Palmitas granite yielded a U-Pb zircon crystallization age of about 250 Ma, slightly older than the other magmatic bodies in the area. It also shows U-Pb relict between 376 and 1731 Ma. An Ar-Ar plateau age of about 70 Ma is indicative of an upper cretaceous thermal disturbance. From the U-Pb SHRIMP data, it appears that the granitoid rocks are reworked material from ancient crustal rocks.

The radiometric data indicate the existence of two separate events in permo-triassic times. The older corresponds to metamorphic ages recorded from the gnaiss of Abejorral and the magmatic ages from the Palmitas granite in permian times, close to the permo-triassic boundary. The second event is defined by magmatic and metamorphic ages in upper triassic times.

The triassic event can be correlated with the triassic orogenies already described in the Loja terrain and the El Oro metamorphic belt of Ecuador. They would represent the beginning of rifting that separated North America from the remaining Pangea. The upper Triassic orogeny in Colombia may be related to shearing along the Romeral fault system, in a model similar to the one presented for the Las Aradas-Baños fault in Ecuador.

The Cambumbia Stock yielded a biotite plateau age of 236 Ma, and the diorite and gabbro of Pueblito yielded magmatic amphibole plateaus ages between 224 and 238 Ma. These rocks may represent oceanic crust material located to the west of the Romeral fault system, and representing a different evolution when compared with rocks of the Central cordillera basement. The triassic age obtained for these rocks is a minimum limit for the Arquia group, a medium to high-pressure belt that appears at the western border of the Central Cordillera.

Lower Cretaceous deformational and hydrothermal alteration ages were recorded for the Sabanalarga batholith. On the basic volcanic rocks of lower cretaceous age of the Quebradagrande formation, hydrothermal K-Ar whole rock ages are indicative of the fault system activity in Albian – Cenomanian times. Ar-Ar analyses from the volcanic rocks yielded biotite plateaus ages close to 90 Ma, interpreted as cooling ages probably related to a not very well constrained deformational episode. Younger K-Ar whole rock ages and Ar-Ar ages for mylonitic zones indicate another important fault system reactivation in Maastrichtian times. The accretion of the Western Cordillera is attributed to this period, and could have produced the consequent reactivation of the Romeral fault system.