# The oldest zircons from the South America Continent

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The Quijingue granite (2,16 Ga), located in the central-north part of the Serrinha Nucleus (SerN), northeast of Bahia, Brazil, is a small (± 21 km$^2$) north-south elongated intrusion bounded by faults. It is emplaced as a dome, cross-cutting the Paleoproterozoic Itapicuru volcano-sedimentary belt and the Archaean gneissic-migmatitic basement of the SerN. The Quijingue granite shows chemical patterns very similar to those of TTG rocks. It has a calc-alkaline signature, with narrow variations of silica and alumina contents. Strong LILE enrichment combined with a high initial Sr ratio (0.705), archaean model age ($T_{2DM}$ = 3,27 Ga) and negative epsilon $Nd_T$ values (-12), indicate contributions from partial melting of an older Archaean continental crust. Zircon crystals as old as 3.6 Ga have now been found in this pluton. Single zircon crystals recovered from the least magnetic fraction from the Quijingue pluton were analyzed by isotope dilution using thermal ionization mass spectrometry at the Royal Ontario Museum, Toronto, Canada. These zircons are typically small, elongate or oval shaped crystals, with rounded edges, mostly without zones. Due to pervasive alteration, only a few grains were suitable for analyses. Based on zircon colour, two distinct populations were isolated: Population one (P1) is a uniform group of generally clear and colourless well-facetted crystals, and predominates in this sample. Population two (P2) consists of rare pink or light brown grains. U-Pb data on P2 zircons yield ages ranging from 3614 ± 2 Ma to 3620 ± 3 Ma (pink) and 2892 ± 2 Ma (pale brown) and have been interpreted as xenocrysts from underlying crust. No evidence was found that they form cores in the younger grains. Another 3.6 Ga old zircon xenocryst was found in the Euclides Granite (3654 ± 125 Ma), located a few kilometres east of Quijingue. Data from these older inherited xenocrysts are almost concordant. They suggest that a crustal growth event occurred at ca 3.6 Ga in the SerN. The colourless crystals (P1) are near-concordant, and give an age of 2155 ± 3 Ma. This is interpreted as the crystallization age of the Quijingue pluton. It agrees with the age of other calc-alkaline Paleoproterozoic plutons from the SerN and probably reflects the beginning of Paleoproterozoic intrusive activity in the SerN area. These are the oldest zircon crystals ever reported from the South American continent. These new data indicate that crust formation in the area began during the early Archean (~3.6 Ga) and continued episodically until ca 2.1 Ga. *Acknowledgments: This work was supported by CAPES (Process: 1332/98-8) and Companhia Baiana de Pesquisa Mineral. This is the contribution number 123 of GPA-CPGG-UFBA.*

# Groundwater contribution to ($^{234}$U/$^{238}$U) a.r. of surface waters : Mount Cameroon case.

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$^{234}$U-$^{238}$U isotope ratios in river waters may represent an appropriate tool to estimate and quantify the nature and the origin of the chemical weathering fluxes carried by rivers (e.g. Vigier et al., 2002). Along with surface weathering fractionation of $^{234}$U and $^{238}$U, riverine U could be influenced by deep U fluxes which are different from those occurring close to the surface (Riotte et Chabaux, 1999, Durand et Chabaux, this issue). The purpose of this study is to focus on the parameters, others than lithology, controlling the $^{234}$U-$^{238}$U fractionation in the hydrological system of Mount Cameroon, by analyses of streams, springs and wells all around this volcano.

At the scale of Mount Cameroon volcano, the ranges of U concentrations and ($^{234}$U/$^{238}$U) activity ratios in surface waters are wide, from 0.01 to 0.3µg/L and from 1.038 to 1.397, respectively. On the basis of major and trace (Sr, Rb, Ba) elements, three groups of water samples were defined, depending on their topographical and geographical locations. Comparison of these data with ($^{234}$U/$^{238}$U) activity ratios demonstrates that only two processes control $^{234}$U-$^{238}$U fractionation in Mount Cameroon waters. Small $^{234}$U-$^{238}$U fractionations, between 1.038 and about 1.10, are related to a surface and meteoric weathering of the bedrock, whatever the nature of secondary mineral phases occurring in the weathering profiles. By contrast, the largest $^{234}$U-$^{238}$U fractionations a deep water U input into surface waters. This interpretation is confirmed by independent hydrological studies of Mount Cameroon, indicating that two kinds of water circulation coexist in the volcano. One consists in small aquifers close to the surface, which leads to low $^{234}$U-$^{238}$U fractionations in surface waters whatever rainfall and altitude of the sampling location. The other corresponds to deeper circulation percolating through Mount Cameroon : these deep waters outflow around the volcano, at low altitude, where they mix with surface waters.

Therefore, variations of ($^{234}$U/$^{238}$U) activity ratios in the surface waters of Mount Cameroon would mainly trace the importance of deep waters supplies into surface waters rather than the intensity and/or on the nature of the surface weathering processes. This study illustrates the potential of $^{234}$U-$^{238}$U disequilibrium to characterise the different water-rock interaction levels which contribute to the chemical fluxes carried by rivers.