

## Re-evaluation of Leonian and Liberian events in the geodynamical evolution of the Man Shield (West African Craton)

Gnagnon R. Stéphane Koffi \*, Alain Niçaise Kouamelan

First UFR STRM, Université Félix Houphouët-Boigny Abidjan-Cocody, 22 BP 582 Abidjan 22, Côte d'Ivoire

\*E-mail: koffignagnon@gmail.com

It is well-established that Archean domain of the Côte d'Ivoire located to the west of the Sassandra fault is composed mainly of formations of the Leonian age (3400-3000 Ma) and Liberian age (2900-2700 Ma). The Paleoproterozoic unit of Toulépleu-ity, bordered more to the west by the Birimian rocks of the Nuon complex, is a characteristic of this area. It is all of these Leonian, Liberian, and Birimian formations that are essentially the subject of U-Pb dating in this work. Indeed, the old dating was carried out by direct evaporation on monograin zircon. This method is ineffective when zircon grains have a complex history.

Thus, one of the major assets of this work is the in-situ dating of the zircon of the Archean domain of Côte d'Ivoire by laser ablation (LA-ICP-MS) in systematic U-Pb and Lu-Hf. Our report outlines Leonian and Liberian events to 3273-3010 Ma and 2877-2716 Ma, respectively. The values of  $\epsilon_{Nd}$  at 3.05 Ga (-2.79 to +4.68) and the values of  $\epsilon_{Hf}$  of zircons (-9.90 to +0.07) attest that the protoliths of these formations are older without neglecting a juvenile component between 3.5 and 3.2 Ga. However, the zircon grains have high Th/U ratios and give  $T_{DM}^c$  of 3.32-3.98 Ga. This represents a probable growth and major recycling in the Man Shield at this time.

Birimian formations of Nuon are composed of gneiss and granodiorites whose age is between 2087-2096 Ma. In contrast the oriented granodiorite that borders the unit of Toulépleu-ity to the south, has an age of 2062 Ma. The values of  $\epsilon_{Nd}$  to 2.1 Ga between +1.48 and +2.35 attest to the juvenile character of these formations. The CAV-1-oriented granodiorite zircons show values of  $\epsilon_{Hf}$  ranging from +0.59 to +4.39 confirming the mantellic origin of these formations with only slight contamination.

The metamorphic conditions were also constrained by Bloléquin basic granulite thermobarometric calculations using the Teriak Domino software. The metamorphic facies are low-pressure granulite type ( $>800^{\circ}C$ ;  $>6Kbar$ ) which undergoes almost isobaric cooling ( $620^{\circ}C < T < 720^{\circ}C$ ;  $6.1 Kbar < P < 7.1 Kbar$ ).

Finally, the geochemistry of REE reveals the archaic character of the Birimian formations, as well as of the Leonian and Liberian formations, while the isotopes of the Nd and Hf actually reveal the interactions between the Archean and Birimian crusts with even the existence of Archean zircons inherited in the Birimian formations. All this gives us the opportunity to propose a geodynamic model in which we suggest that these interactions took place initially in a context of rifting of the Archean proto-continent between 3.0 and 2.7 Ga. During this period, an oceanic crust and volcanic arcs system associated with subduction zones are generated and are subsequently recycled, after the Archean, by the Burkinian orogenesis that will set up the Dabakalian magmas between 2.5 and 2.2 Ga (early Birimian).

All the data obtained help to re-evaluate the Leonian and Liberian events and to identify the interaction of their formations in the Birimian geodynamics.

**Keywords:** Leonian, Liberian, Birimian, tectono-metamorphic event, U-Pb Method, Lu-Hf Method, LA-ICP-MS rifting, volcanic arc