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The Columbia Supercontinent Reconstruction: Perspectives Of The Île de Cayenne Complex (French Guiana)

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A precise 1/125e geological mapping together with multi-approach study (deformation, back-scattered imaging, U-Pb and Ar-Ar dating, petro-geochemistry) of amphibolite, métrondhjemite, metagabbro and tonalitic units outcropping in French Guiana. These samples are part of the Amazonian Carton and provides strong constraints on the early evolution of the Paleoproterozoic Transamazonian orogenic event. This orogen represents a crucial period for the evolution of the Columbia superstructure for which final assembly occurred at ca. 1.8 Ga [1]. The studied samples come from the Pointe Buzaré and Pointe des Amandiers belonging to the Ile de Cayenne Complex (Cayenne, French Guiana). No exhaustive sampling and analysis using recent techniques has been carried out on these outcrops despite the evident connection between these samples from the Amazonian Craton and the West African Craton. Major and trace elements of amphibolites display a sub-alkali basalt composition with tholeiitic affinity and yield flat T-MORB-like REE patterns (La/Yb_N=1). Major and trace elements of metatrondhjemite display a dacitic composition and yield REE patterns significantly LREE enriched compared to HREE (La/Yb_N=11-13). One metagabbro provides geochemical features similar to amphibolites. Ar-Ar plateau ages of amphibole crystals from the amphibolitic units range from 1999 Ma to 1983 Ma. Ar-Ar biotite dating from a metatrondhjemite shows a significantly lower age of 1764 ± 4Ma. Back-scattered images of zircon grain show complex internal structure with both magmatic oscillatory growth and convoluted zoning. In-Situ Laser-Ablation Split-Stream (LASS)-ICP-MS analyses have been performed on accessory minerals from each sample (i.e. zircon, monazite, titanite and apatite when present), allowing to precisely connect protolith isotopic signatures to absolute ages for different growth zones identified on a single crystal. A significant and marked event at ca. 2.2 Ga is registered by U-Pb analyses on zircon from amphibolite and gabbro. This age is interpreted as the main mantle extraction event and oceanic crust formation. Combination of isotopic constraints (Hf-zircon, Nd-monazite, Sr-apatite) with precise ages using different U-Pb geochronometers allows us discussing in detail the significance of this part of Amazonian craton in the Columbia supercontinent evolution.

[1] Zhao & al., Earth-Science Reviews 67 (2004) 91–123