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(U-Th-Sm)/He dating of supergene Fe duricrusts in NE French Guiana: implications of a multiproxy approach

Beatrix Heller^{1,2}, Silvana Bressan Riffel³, Cécile Gautheron¹, Thierry Allard², Guillaume Morin², Jean-Yves Roig⁴, and Renaud Coueffe⁴

¹GEOPS, University Paris Saclay, Orsay, France (beatrix.heller@universite-paris-saclay.fr)

²IMPMC, Sorbonne University, Paris, France

³Federal University of Rio Grande do Sul, Porto Alegre, Brazil

⁴BRGM, Orléans, France

Laterites are developing under intense chemical weathering and low physical erosion rates. Despite their large extension at the Earth's surface, there is still a lack of time constraints for their formation, evolution and relation with climatic change. Nevertheless, several chronological studies show that they represent a geological record at least all along the Cenozoic Era. Indeed, laterite samples often contain several coexisting generations of iron oxides and oxyhydroxides that indicate successive weathering processes due to the dissolution of previously formed phases followed by reprecipitation. This study focuses on the condition and chronology of weathering in Northeastern French Guiana which generated pedogenic iron crusts on Paleoproterozoic mafic and intermediate rocks. It offers the opportunity to document the evolution of this part of the Guyana Shield, known as a tectonically stable area since the Cretaceous. The two sampling sites, Kaw and Baduel, are paleosurfaces at 300m and 100m elevations, respectively, that have been dated previously by paleomagnetism, providing Eocene ages for both sites, albeit with some substantial uncertainties and dispersion [1].

Since the duricrust (top layer) of the lateritic profile is enriched in hematite and goethite, we aim to date those mineral phases using the (U-Th-Sm)/He method. Older ages are from Oligocene and Miocene epochs for the Kaw and Baduel sites, respectively, with a large dispersion in the age values, as expected from the presence of several generations of Fe-minerals. Identification of petrological relationship between these different generations is hindered by their intimate mixing. In order to overcome this difficulty and to identify the episodes of weathering and mineral precipitation, we coupled a number of mineralogical and geochemical analyses, namely through powder and single grain X-ray diffraction, energy dispersive X-ray spectrometry (SEM-EDS) and solution- and LA-ICP-MS. Data on formation ages of secondary iron phases will be discussed by reference to literature, in terms of geodynamic and paleoclimatic forcing.

[1] Théveniaut, H., and Freyssinet, P. (2002): Timing of lateritization on the Guiana Shield: synthesis of paleomagnetic results from French Guiana and Suriname. *Palaeogeography, Palaeoclimatology, Palaeoecology* (178) 91-117

