

# Recent developments and applications of kaolinite dating: examples of weathering covers from the Amazon Basin (Brazil)

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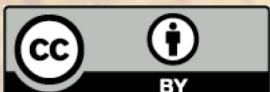
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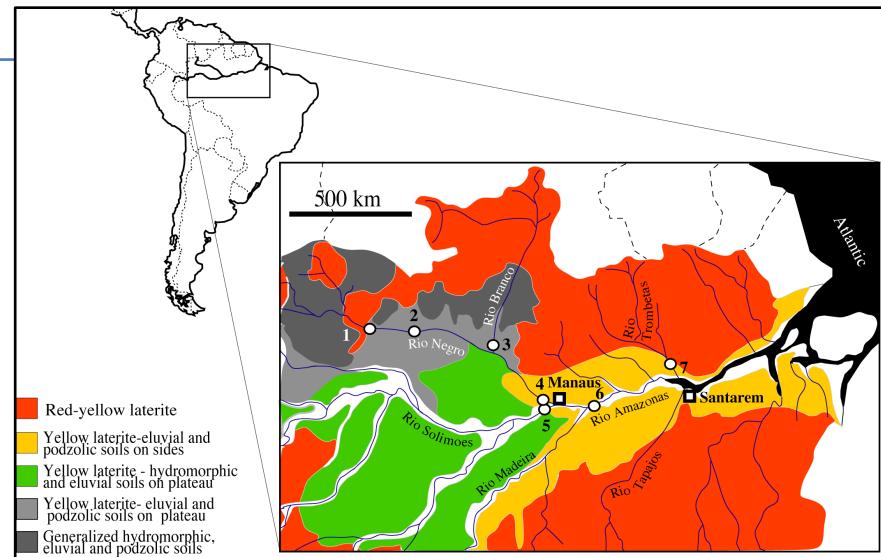
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# Introduction

- Laterites ~ 1/3 of emerged continental surface
  - ~ 80 % of soil volume (1)
- Reconstruction and understanding of evolution of weathering covers in the Amazon Basin
  - => dating of secondary minerals
- What is the relation of laterites formation/evolution in this region with geodynamics and global or regional paleoclimates ?
- Kaolinite (together with iron oxides and oxyhydroxides), is a major secondary mineral of laterites.
- It has been shown that **natural radiation-induced defects cumulated in kaolinite can be used as geochronometers.**



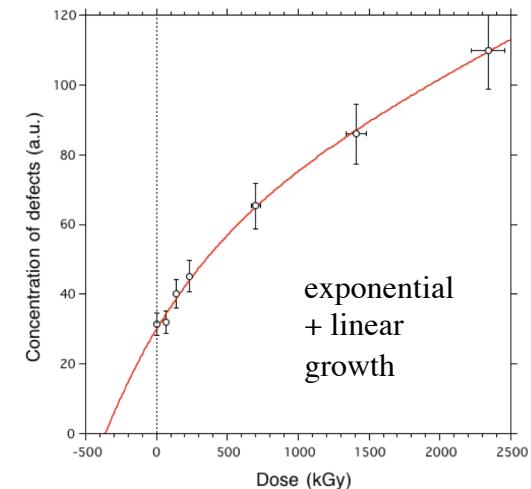
# Updated methodology for Kaolinite dating by EPR spectroscopy

Experimental  
irradiations



ARAMIS accelerator, Orsay, France

Electron  
Paramagnetic  
Resonance  
Spectroscopy



$$\text{Age} = \frac{\text{Paleodose}}{\text{Dose rate}} + \text{corrections}$$

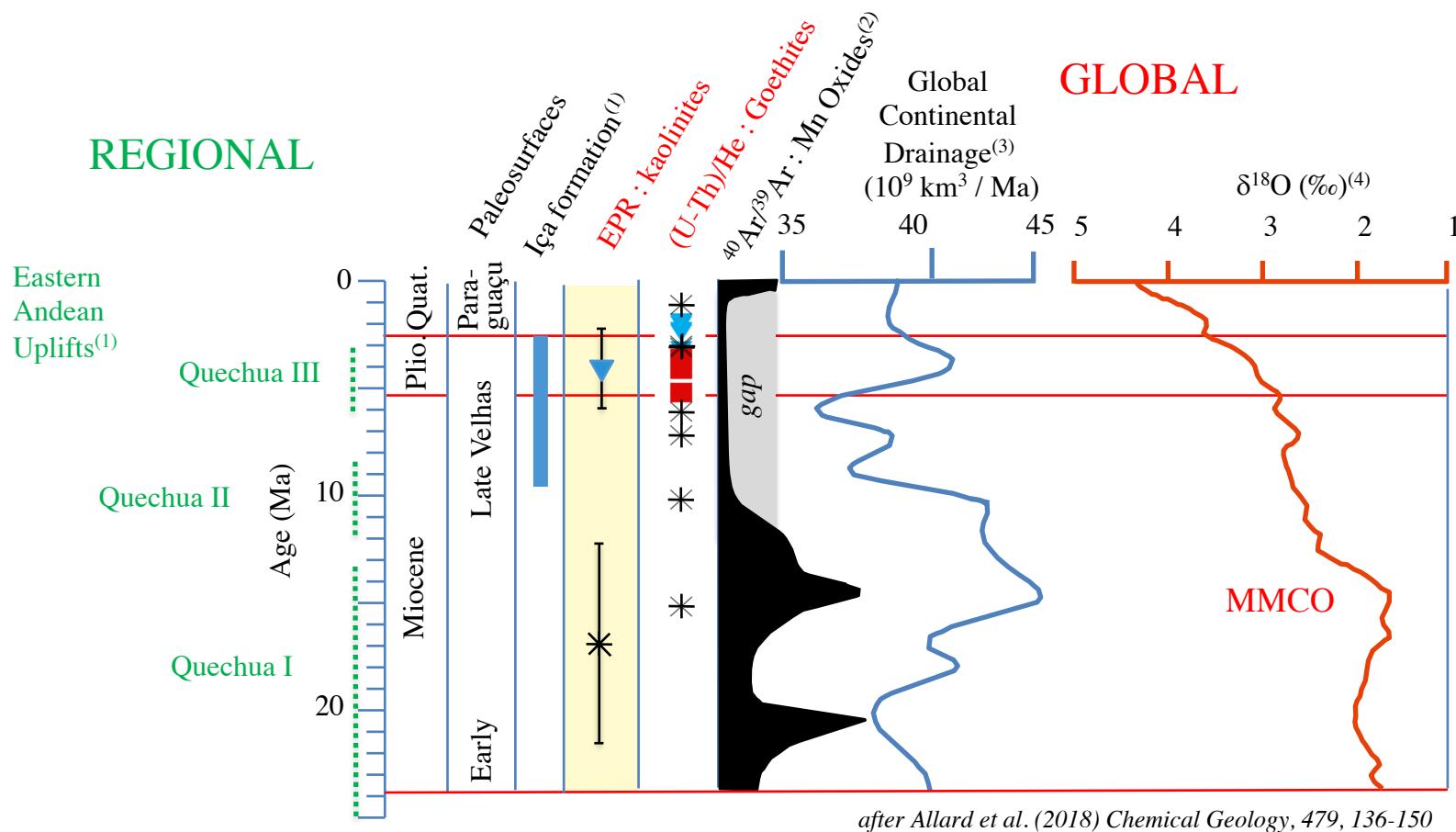
Paleodose

Dose rate

[U], [Th], [K]

- spatial distribution U (*induced fission tracks*)
- aperture of the system (*gamma spectrometry*)
- Quartz absorber and diluting agent (*optical microscopy + chemistry*)
- water content (*average value*)

# Example : dating kaolinites from Fe-duricrusts (Amazonia, Brazil)



- Major weathering episodes at Miocene – Quaternary period
- Relations with some geodynamic and paleoclimatic events

(1) Campbell et al. (2006). Palaeogeogr. Palaeoclimatol. Palaeoecol. 239, 166–219.

(2) Vasconcelos et al. (1994). Geochim. Cosmochim. Acta 58 (6), 1635–1665.

(3) Tardy, Y., Roquin, C., (1998). Dérive des continents, Paléoclimats et alterations tropicales. BRGM, Orléans.

(4) Zachos et al. (2001) Science 292, 686–693.