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

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Revealing the age of secondary minerals derived from weathering participates to an increasingly detailed understanding of evolution of continental surfaces. Among weathered materials, laterites represent 1/3 of emerged continents area and 80 % of global soil volume [1]. At a global scale, the Amazon Basin is a major basin where the chronology of weathering covers, witnesses of its past geodynamic and paleoclimatic evolution, is still poorly documented. It was demonstrated that kaolinites from laterites can be dated using their concentration in radiation-induced paramagnetic defects and that their ages can be discussed in terms of geodynamic or paleoclimatic episodes [2] [3] [4] [5] [6]. This complements Fe (oxyhydr)oxides and Mn oxides dating in weathering covers.

In a first part, recently upgraded steps of the methodology for kaolinite dating will be presented. They include an improved fitting strategy of dosimetry curves and a better assessment of radiation dose rate in the investigated samples, accounting for an heterogeneous spatial distribution of radionuclides and for some degree of geochemical opening due to Rn mobility.

In a second part, contrasting examples of kaolinite dating in laterites (from loose horizons or iron duricrusts) occurring in the Amazon Basin will be presented. These data highlight that weathering episodes revealed by kaolinite dating mostly range over late Miocene to Quaternary periods. Discussion will first point to profile genesis, showing that rejuvenation of kaolinites or erosion may have prevailed and obliterated more ancient generations, and that variation of ages along profiles allow simple models of weathering fronts propagation to be proposed. In addition, kaolinite ages will be discussed by comparison to the geochronology of main geodynamic or paleoclimatic events in the region.

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