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The environmental record of secondary silica minerals in weathered rocks

J.D. Meunier (1) and I. Basile-Doelsch (1,2)

(1) CEREGE, CNRS-UPCAMIII-IRD, BP 80, 13545 Aix-en-Provence Cedex 04, France (meunier@cerege.fr / Fax: 33 (0) 442 971 540 / Phone: 33 (0) 442 971.526); (2) IRD/Reunion, UR161, LSTUR, BP 172, 97492 St-Denis Messagerie Cedex, France.

The goal of this presentation is to highlight recent advances in the understanding of the origin of secondary silica minerals using micromorphological, geochemical and isotopical approaches.

Silicon is, after oxygen, the most important element in soil minerals with an average concentration of 330mg/g. During weathering of parent rock silicates, silicon is released into the soil solution and may follow several pathways: 1)removal from soil profile towards groundwater and rivers; 2) precipitation as aluminosilicates or silica minerals and 3) plant uptake and phytolith formation. Phytolith particles are composed of amorphous silica (opal-A). The phytolith pool is generally a minor constituent of soils (0.1-3 wt% of soil's fine fraction) but it can be helpful for paleoenvironemental reconstructions:1) using morphological analysis, phytolith assemblages along soil profiles and buried soils can detect vegetation change such as forest/savannah transitions, C3/C4 grassland evolution and dry to humid local changes; 2) the isotopic composition of carbon occluded in grass phytoliths may provide a record for the C3/C4 composition of past grasslands; 3) the oxygen isotopic composition of grass phytolith is a potential proxy for the water cycle temperature in paleoclimatic studies.

Neoformed silica occurs as different polymorphs (opal-A; opal C-T, chalcedony, quartz) and fabrics (cutane, cement, overgrowth, silcrete). Recent isotopic studies have shed a new light on the environmental significance of quartz cements in silcrete. The oxygen isotopic composition of quartz cement fraction, separated from the bulk , can give valuable informations on forming waters and temper-

atures. The use of in situ silicon isotopes suggests that quartz overgrowth may form by a process of dissolution/recrystallisation of microcristalline quartz.

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