INTRA-PROFILE VARIATIONS IN O AND H ISOTOPIC COMPOSITIONS OF LATERITIC MINERALS: WHAT DO THEY RECORD ?

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It has long been known that ancient weathering minerals may preserve their original 18O/16O and D/H ratios, and therefore carry a time signal. Recent studies in laterites have shown that intra-profile variations may provide a record of paleoclimatic changes. However, they may also result from other causes. Awareness should exist that many pitfalls can complicate data interpretation. A major difficulty remains obtaining pure mineral separates, in particular for clays. New and efficient techniques, such as Na-polytungstate densimetry, are now available. However, a monomineralic separate may comprise many generations of different age of the same mineral. This can be evidenced by investigating different grain-size cuts, but the different generations may not be amenable to be segregated apart. Results of our studies in Amazonia and Africa indicate that the time signal is best expressed in minerals formed rapidly at the weathering front and not subjected to post-formational remobilization. A good candidate is goethite pseudomorph after pyrite, which offers the possibility to study O and H isotopes. Hematite pseudomorph after magnetite is not ideal because of the lack of H and because of O inheritance from magnetite. Groundmass microcrystalline clay and oxi-hydroxide are susceptible to remobilization, through successive dissolution-precipitation, which may obliterate the paleoclimatic signal. Successful investigations of intra-profile variations of stable isotopes in ancient soil systems, such as laterites, must rely on an integrated approach using both oxygen and hydrogen isotopes from several coexisting weathering minerals.