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Use of ^{238}U-^{234}U-^{230}Th radioactive disequilibria to constrain the recent dynamics of lateritic iron caps: inferences from the Kaya lateritic toposequence.

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The lateritic iron cap formations constitute large morphological surfaces whose emplacement and evolution processes, and their related time-constants are still maters of debate. The geochemical study of an old lateritic toposequence, i.e., the Kaya toposequence, in Burkina Faso, leads to a quite simple formation scenario and demonstrates that the ferruginous hard caps, in the toposequence, are presently in a dismantling state (1-2). We propose here to compare the variation of ^{238}U-^{234}U-^{230}Th disequilibria in two profiles of contrasted topographic position, to constrain the recent dynamic of the iron cap dismantling. The U series disequilibria are modelled by using a simple scenario of U mobility within the toposequence, and a Monte Carlo inverse method for solving the related equations. Application of this approach to the Kaya lateritic toposequence pointed out that the minimum age for the iron cap brake down is ranging between 500ka and 800ka. Furthermore, the U-mobility associated to the iron cap dismantling accounts for the U enrichments in the underlying saprolite. The ages of the saprolite U-enrichments are variable and without simple relationship with depth. These variations imply that the intensity of the iron-cap dismantling have varied with time, possibly in response to quaternary climatic variations. Extensive application of the U radioactive disequilibria method to weathering analyses of bulk, granulometric fractions or in situ minerals, could become in the future a very powerful tool for understanding and quantifying the impact of climatic variations on the weathering processes, as well as for quantifying recent mobility in such formations.

1 Dequincey et al. (2002), GCA, 1197-1210; 2 Dequincey et al. (2005), Eur. J Soil Sc., in press.