

# Present and paleo weathering rates by analysis of $^{238}\text{U}$ - $^{234}\text{U}$ - $^{230}\text{Th}$ disequilibria in soil and paleosols profiles

FRANCOIS CHABAUX<sup>1</sup>, ERIC PELT<sup>2</sup>, FRANCISCO  
HEVIA-CRUZ<sup>3</sup>, ANTHONY HILDENBRAND<sup>3</sup>, NATHAN  
SHELDON<sup>4</sup>, RAPHAEL DI CHIARA ROUPERT<sup>2</sup>, THIERRY  
PERRONE<sup>2</sup> AND JÉRÔME VAN DER WOERD<sup>2</sup>

<sup>1</sup>ITES CNRS - Strasbourg France

<sup>2</sup>ITES CNRS - Université de Strasbourg France

<sup>3</sup>Université Paris-Saclay, CNRS, UMR8148 GEOPS

<sup>4</sup>University of Michigan

Presenting Author: [fchabaux@unistra.fr](mailto:fchabaux@unistra.fr)

The developments carried out at Strasbourg on the use of  $^{238}\text{U}$ - $^{234}\text{U}$ - $^{230}\text{Th}$  radioactive disequilibria in weathering profiles to determine their rate of formation were made in close collaboration, for some of them, with Susan Brantley's group (1-5).

This work has led to the definition of a now classical approach for the determination of these parameters. More recent work, notably at the Strengbach site, illustrates the benefits of combining U-series disequilibria with cosmogenic  $^{10}\text{Be}$  analysis to discuss the degree of millennial stability of the regolith between production by alteration and destruction by denudation (6). We have also shown that application of  $^{238}\text{U}$ - $^{234}\text{U}$ - $^{230}\text{Th}$  disequilibrium methodology for the determination of the regolith production rates in thick weathering profiles, marked by long histories, cannot be recovered by applying in one step to the entire weathering profile the modeling approach classically used to interpret the U-series nuclides. The modeling has to be made on subsections of relatively small size (< 1 or 2 m of thickness), so that the model assumptions can be met, especially the constancy of the mobility parameters along the weathering zone (7). Currently, we are seeking to assess the potential of applying U-disequilibrium in paleosols - based on paleosols collected in the Azores - to determine the paleo-alteration rates at the origin of these formations. These results could open up a new, as yet little-explored application field for U series to reconstruct the past history (<250ka) of terrestrial weathering.

1- Pelt et al. (2008) EPSL, 276 98-105 2- Ma et al. (2010) EPSL 297, 211-225 3- Ma et al. (2012) Geochimica et Cosmochimica Acta, 80, 92-107 4- Chabaux F. et al. (2013) Geochimica et Cosmochimica Acta, 100, 73-95. 5- Ma et al. (2013). Journal of Geophysical Research. Earth Surface 118, 722-740. 6- Ackerer et al. (2016) EPSL 453, 33-43 7- Jia et al. (2021) Chem. Geol., 574 - 120241