

## Contrasting silicon and magnesium isotope fractionation with clay mineralogy in volcanic soil weathering sequences, Guadeloupe

B. DELVAUX<sup>1</sup>, S. OPFERGELT<sup>1,2</sup>, R.B. GEORG<sup>3</sup>,  
Y-M. CABIDOCHÉ<sup>4</sup>, K.W. BURTON<sup>2</sup> AND  
A.N. HALLIDAY<sup>2</sup>

<sup>1</sup>Earth and Life Institute, Université catholique de Louvain,  
Louvain-la-Neuve, Belgium  
(sophie.opfergelt@uclouvain.be)

<sup>2</sup>Department of Earth Sciences, University of Oxford, Oxford,  
United Kingdom

<sup>3</sup>Trent University, Water Quality Centre, Peterborough,  
Ontario, Canada

<sup>4</sup>INRA, UR 135 Agropedoclimat Zone Caraïbe Environm &  
Agro, Petit Bourg, Guadeloupe

The weathering of continental silicate rocks influences global climate by consuming atmospheric CO<sub>2</sub>. Magnesium and Si stable isotopes are used as weathering proxies in soils and rivers, but the impact of the mineralogy of secondary phases on isotope fractionation remains unexplored so far. Here, we investigate variations in  $\delta^{26}\text{Mg}$  vs. DSM-3 and  $\delta^{30}\text{Si}$  vs. NBS28 in bulk soils and clay fractions relative to their parental andesite in two soil weathering sequences (Guadeloupe) that were formed in contrasting climatic conditions. The Western slope of La Soufrière volcano (dry conditions) presents a soil sequence Andosol - Cambisol - Vertisol with formation of smectite, whereas the Eastern slope (high rainfall) presents Andosol - Nitisol - Ferralsol with formation of kaolinite.

For Mg isotopes, clay fractions ( $\delta^{26}\text{Mg}$  -0.41 to -0.10‰) were isotopically heavier than the andesite ( $\delta^{26}\text{Mg}$  -0.47‰), supporting a preferential incorporation of heavy Mg isotopes in secondary Mg-bearing clay minerals. The clay fractions on the Eastern slope were progressively heavier with increasing weathering degree, -in contrast to the Western slope where clay fractions were progressively lighter with increasing weathering degree and with increasing exchangeable Mg associated with smectite. For Si isotopes, clay fractions were lighter than the parental material, and progressively lighter with increasing weathering degree. More importantly, larger Si isotope fractionation was associated with the formation of kaolinite ( $\delta^{30}\text{Si}$  -1.95 to -1.32‰) than with the formation of smectite ( $\delta^{30}\text{Si}$  -1.05 to -0.94‰) relative to the parental andesite ( $\delta^{30}\text{Si}$  -0.37‰). Our results highlight that a similar parental andesite exposed to different climatic conditions can generate contrasting Mg and Si isotope fractionations in secondary phases, which offers great potential for paleo-reconstruction of soil environments.

## Impact of reductants on the optical properties of Humic Substances (HS)

ROSSANA DEL VECCHIO\*<sup>1,2</sup> LYNNE HEIGHTON<sup>1</sup>,  
KELLI GOLANOSKI<sup>1</sup> AND NEIL V. BLOUGH<sup>1</sup>

<sup>1</sup>Department of Chemistry and Biochemistry University of  
Maryland, College Park, MD United States

<sup>2</sup>Earth System Science Interdisciplinary Center, University of  
Maryland, College Park, MD United States  
(\*correspondence:rossdv@umd.edu)

Our previous results have shown that the reduction with sodium borohydride of Suwannee River humic and fulvic acids, a commercial lignin, and a series of solid phase C18 extracts from fresh, estuarine, coastal and offshore waters of the middle Atlantic bight produces a preferential loss of long wavelength (visible) absorption and enhanced, blue-shifted emission [1]. These results are consistent with and interpreted within a previously proposed charge transfer model [2, 3]. Here we extend this work to other reducing agents (such as cyanoborohydride and sodium dithionite) and other humic substances (from aquatic and soil environments) to investigate the impact of other reductants on the optical properties of humic substances and attempt to assess the relative importance of quinones and ketones to the optical properties of these materials. Preliminary results indicate that a) borohydride reduces all HS examined independent of their source as determined by UV/Vis and fluorescence; b) cyanoborohydride did not reduce any of the HS examined to a significant extent; c) dithionite appears to reduce HS but to a much smaller extent than borohydride. Ongoing work aims to extend this work to more HS and model quinones/ketones and to quantify the loss of absorption with respect to dithionite consumed.

- [1] Ma *et al.* (2010) *Environ. Sci. Technol.* **44**, 5395-5402.  
[2] Del Vecchio and Blough (2004) *Environ. Sci. Technol.* **38**, 3885-3891. [3] Boyle *et al.* (2009) *Environ. Sci. Technol.* **43**, 2262-2268.