

## Boron isotope systematics during magma-carbonate interaction

F.M. DEEGAN<sup>1</sup>, E.M. JOLIS<sup>1</sup>, V.R. TROLL<sup>1,2</sup>, C. FREDA<sup>2</sup>  
AND M.J. WHITEHOUSE<sup>3</sup>

<sup>1</sup>Dept. Earth Sci. (CEMPEG), Uppsala University, Uppsala, Sweden. (Frances.Deegan@geo.uu.se)

<sup>2</sup>Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy

<sup>3</sup>Swedish Museum of Natural History, Stockholm, Sweden

Carbonate assimilation is increasingly recognised as an important process affecting the compositional evolution of magma and its inherent ability to erupt explosively due to release of carbonate-derived CO<sub>2</sub> [e.g., 1, 2, 3]. In order to gain insights into this process, we performed short time-scale carbonate dissolution experiments in silicate melt using natural starting materials from Merapi and Vesuvius volcanoes at magmatic pressure and temperature [1, 4]. The experiments enable us to resolve in detail the timescales, textures and chemical features of carbonate assimilation. Three compositionally distinct glass domains have been defined: i) Ca-normal glass, similar in composition to the starting material; ii) Ca-rich, contaminated glass; and iii) a diffusional glass interface between the Ca-normal and Ca-rich glass. Here we present new boron isotope data for the experimental products obtained by SIMS. The glasses show distinct and systematic variation in their  $\delta^{11}\text{B}$  values. The contaminated regions generally show extremely negative  $\delta^{11}\text{B}$  values (down to -41 ‰) relative to fresh arc volcanics (-7 to +7 ‰ [5]). Considering that carbonates have  $\delta^{11}\text{B}$  values of +9 to +26 ‰ [6], the data can not be explained by simple mixing processes between the end-members alone. This implies that the  $\delta^{11}\text{B}$  of the original contaminant was drastically modified before being incorporated into the melt, which can be explained by B isotope fractionation during early degassing of the carbonate. Our preliminary results are the first of their kind and provide well constrained insights into the behaviour of boron upon degassing of carbonate. This in turn has implications for both late stage contamination in dangerous volcanic systems and deep subduction zone processes, where B is frequently employed as a tracer of crustal recycling.

[1] Chadwick *et al.* (2007) *J. Petrol.* **48**, 1793-1812.

[2] Deegan *et al.* (2010) *J. Petrol.* **51**, 1027-1051. [3] Freda *et al.* (2010) *Bull. Volcanol.* DOI: 10.1007/s00445-010-0406-3

[4] Jolis *et al.* (2011) *Min. Mag.*, this volume. [5] Leeman & Sisson (1996) *Rev. Min.* **33**, 645-707 [6] Ishikawa & Nakamura (1993) *Earth Planet Sci. Lett.* **117**, 567-580.

## Alteration of nitrogen isotopic signatures during phytoplankton degradation

A. DEEK<sup>1\*</sup>, M. F. LEHMANN<sup>1</sup> AND C. J. SCHUBERT<sup>2</sup>

<sup>1</sup>University of Basel, Institute of Environmental Geosciences, Bernoullistr. 30, CH-4056 Basel, Switzerland

(\*correspondence: astrid.deek@unibas.ch)

<sup>2</sup>Eawag, SURF, CH-6047 Kastanienbaum, Switzerland

Stable nitrogen isotope ratios in sediments are widely used in paleoenvironmental studies to reconstruct past biogeochemical conditions and processes in the water column. Previous investigations have revealed that both the decay of sinking particulate organic matter in the water column and early diagenesis of deposited organic matter within sediments are associated with significant bulk N isotope effects that can mask primary isotope signals.

To study the mechanisms that underly the alteration of N isotope signals by bacterial degradation, we conducted a series of oxic and anoxic incubation experiments that mimic the decay of organic matter in nature. We used closed system experiments containing defined algae/sediment mixtures (*Chlorella vulgaris*), suspended in oxic or anoxic water from Lake Lugano, and inoculated with a natural consortia of bacteria. In order to assess N isotope partitioning during simulated organic matter decay, we monitored the N-isotope changes in specific organic (amino acids, amino sugars) and inorganic compounds (NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup>) in both the particulate and dissolved fractions.

We will present initial data in the light of organic compound selectivity, kinetic isotope fractionation associated with degradation of specific organic components, and the effect of bacterial biosynthesis on bulk N isotope composition during early diagenesis.