# Zn mobility during oceanic crust alteration inferred by its isotopic composition

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In the last 10 years, with the multiplication of MC-ICP-MS, our knowledge of the transition metal isotope geochemistry has been expanded. Among the studied elements, Zn became a useful tracer in biological systems and to trace anthropogenic activities [1,2]. However, Zn geochemical behaviour still suffers from lack of information and remains not well characterised.

In this work, we studied volcaniclastic sediment and basalts from ODP Leg 129, Sites 800 & 802A, located in the northern Pigafetta Basin near the HIMU Seamount and in the center of the East Mariana Basin. The two sites were drilled for about 500 m through sediment sequence largely constituted of volcaniclastic sediments. Calcium and Sr contents and Sr isotopes already demonstrated the role of diagenetic reactions in these cores. The aim of the study was to investigate the mobility of Zn during various reactions occurring in these cores like alteration, diffusion and diagenetic processes in real samples.

After Zn isolation from the matrix, the isotopic composition was measured by MC-ICP-MS. All the results are expressed relative to IRMM 3702 which presents a $\delta^{66}$Zn of +0.3‰ compared to $JMC_{lyon}$. The $\delta^{66}$Zn total range is from 0.1 to 0.6‰ for the two cores, the highest value being found at the top of the core. Both cores present a similar behaviour with a mean value around 0.3‰ reflecting their relative homogeneity in the volcaniclastic sediments. The value obtained for the basalt is also around 0.3‰ which is higher than values reported so far for fresh basalts (0‰). Zn isotopes do not fully follow Sr isotopes behaviour. However, a trend of the Zn isotopic composition to the light value from the top to the bottom of the core is observed. Such a variation can be interpreted in term of interaction between the sea water and the sediments from one part and between hydrothermal fluids and sediments from an other part.

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# Calcium isotope fractionation during plant growth under limiting and non-limiting nutrient supply

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Hydroponic experiments have been performed to identify the co-occurring geochemical and biological processes affecting Ca isotopic compositions within plants. Four experiments have been conducted combining two Ca concentrations (5 and 60 ppm) and two pHs (4 and 6). Another experiment was performed with limiting Ca nutrient supply at 5 ppm Ca and pH=6. All the experiments have been achieved on bean plants in order to have access to a complete growth cycle in a short duration. Several organs (root, stem, leaf, reproductive) were sampled at two different growth stages (10 days and 6 weeks of culture).

Our results show, in agreement with previously published field studies [1, 2, 3,4], that all the bean organs are enriched in the light $^{40}$Ca isotope compared to the nutritive solution. Moreover, Ca concentrations and pH influence Ca isotopic composition within plant organs. We identified three fractionation levels. The first one occurs during the uptake of the nutrient elements by the lateral roots. The second one takes place during the long distance transport of Ca, from roots to shoots. The third one takes place during formation of reproductive organs. The experiment with limited Ca supply shows a $^{44}$Ca enrichment in solution through time; the plants seem to establish an isotopic equilibrium with the nutrient solution.

The data confirm the potential of the Ca isotopic system for tracing biological fractionations in ecosystems.

[1] Wiegand *et al*., (2005). *Geophys*. *Res*. *Lett*., **32**, L11404. [2] Page *et al*., (2008). *Biogeochemistry*, **88**, 1-13. [3] Cenki-Tok *et al*,. (2009). *GCA*, **73**, 2215-2228. [4] Holmden and Bélanger (2010). *GCA*, **74**, 995-1015.