

## ***In situ* investigation of microbial diversity and anaerobic chlorobenzene degradation along a vertical gradient**

IVONNE NIJENHUIS<sup>1\*</sup>, PAULA MARTINEZ<sup>2</sup>,  
HOWARD JUNCA<sup>3</sup>, NICOLE STELZER<sup>1</sup>,  
GWENAËL IMFELD<sup>1</sup>, STEFANIE WEBER<sup>1</sup>  
AND HANS RICHNOW<sup>1</sup>

<sup>1</sup>Departments of Isotope Biogeochemistry and

<sup>2</sup>Bioremediation, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany.

(\*correspondence: ivonne.nijenhuis@ufz.de)

<sup>3</sup>AG Biodegradation, Environmental Microbiology, Helmholtz-Zentrum für Infektionsforschung - HZI Braunschweig, Germany

Chlorobenzene (CB) is a contaminant almost ubiquitously found throughout the Bitterfeld/Wolfen region in Germany. Previous investigations supported the anaerobic biodegradation of CB in a contaminated aquifer [1, 2]. An integrated investigation was performed to elucidate the *in situ* microbial activity along a vertical gradient in the same aquifer. Geochemical, molecular biological as well as stable isotope tracer approaches were used in parallel.

Blank, <sup>12</sup>C- or [<sup>13</sup>C<sub>6</sub>]- CB amended *in situ* microcosms were incubated at two levels in a groundwater well for 120 days. Over this time period, the geochemical parameters and contaminant concentrations were monitored along the vertical profile. After 120 day incubation, the *in situ* microcosms were retrieved and activity of *in situ* microcosms was investigated using incorporation of <sup>13</sup>C into total lipid fatty acids (TLFA) and potential metabolites as indicator. A molecular biological investigation was performed to investigate the overall and functional diversity of the established biomass within the *in situ* microcosms and in the surrounding groundwater.

TLFA isotopic analysis suggested a higher CB degradation activity in the upper section of the gradient, where nitrate was present as the potential electron acceptor compared to the lower section where sulfate and CO<sub>2</sub> could be the relevant electron acceptors. Analysis of the overall bacterial community and functional gene profiles also supported this difference comparing the upper and lower levels.

[1] Kaschl A., Vogt C., Uhlig S., Nijenhuis I., Weiss H., Kästner M., and Richnow H. H. (2005) *Environ Toxicol Chem* **24**(6), 1315-1324. [2] Nijenhuis I., Stelzer N., Kastner M., and Richnow H. H. (2007) *Environ Sci Technol* **41**(11), 3836-42.

## **Unravelling the sources of Italian K-rich volcanism with melt inclusions**

IGOR K. NIKOGOSIAN AND MANFRED J. VAN BERGEN\*

Dept. of Earth Sciences, Utrecht University, the Netherlands

(\*correspondence: vbergen@geo.uu.nl) (iniki@geo.uu.nl)

Relationships between the wide variety of parental K-rich magmas along the Tyrrhenian border of peninsular Italy and the nature of their metasomatically altered mantle sources remain poorly understood. To address this issue, we have collected major and trace-element data for olivine-hosted (Fo=89-91.5) melt inclusions (MI) in mafic lavas (5-7 wt.% MgO) from Roccamonfina and Ernici, covering the entire spectrum of low-K (<1.5 wt.% K<sub>2</sub>O, CA), medium-K (1.5-5 wt.%, HKCA-SHO) and high-K (4-8 wt.%, HKS) products.

Results show that bulk compositions of mafic lavas in each series have evolved from more primitive magmas, which represent a collection of highly variable primary melts. Compositional trends of MI are consistent with progressive melt extraction from veined lithologies, but the whole potassium spectrum cannot be derived from a common source with a single metasomatic imprint. Instead, we infer that the HKS source is markedly different from the other sources in terms of mineralogy and chemistry.

A group of K-poor MI in HKS samples, with compositions not represented by erupted products, carries trace-element signatures pointing to metasomatism by carbonatite-like melts similar to those occurring as erupted products in the coeval Intra-Appennine Volcanic province. They form a continuous trend towards predominant inclusions of K-rich melt recording source components created by simultaneous or sequential infiltration of melt from subducted terrigenous metasediments. We infer that parental HKS magmas are largely derived from the vein portion of a heterogeneous phlogopite (±amphibole±apatite) wehrlitic mantle. In contrast, primitive MI in medium-K lavas have volatile and trace-element signatures pointing to a metasomatic imprint by hydrous fluids. Major element contents (e.g. CaO up to 18 wt.%), are consistent with an amphibole-bearing wehrlitic source for shoshonitic magmas, possibly with a subordinate role of phlogopite. Xenocrysts of low-Ca mantle olivine in SHO-CA lavas, presumably an incongruent melting product of amphibole (and/or phlogopite), support this. A group of Si-undersaturated low-K MI with high CaO/Al<sub>2</sub>O<sub>3</sub> ratios (>1.2) and fluid-depleted signatures suggest that 'calcalkaline' magmas in this area originate either from the same source following the exhaustion of amphibole, or from a separate wehrlitic-pyroxenitic assemblage.

Melting of this diversity of sources was probably induced by a heat pulse from inflowing asthenosphere in response to slab detachment.