

## Cosmogenic $^{36}\text{Cl}$ calibration of potassium production rates

SHASTA M. MARRERO<sup>1\*</sup>, FRED M. PHILLIPS<sup>1</sup>,  
JOHN O. STONE<sup>2</sup> AND BRIAN BORCHERS<sup>1</sup>

<sup>1</sup>New Mexico Tech, 801 Leroy Pl., Socorro, NM 87801, USA

(\*correspondence: shasta@nmt.edu, phillips@nmt.edu)

<sup>2</sup>Department of Earth and Space Sciences and Quaternary Research Center, University of Washington, Box 351310, Seattle, WA 98195-1310, USA

As part of the CRONUS-Earth  $^{36}\text{Cl}$  project, geological calibrations of *in situ* production rates of cosmogenic nuclides, including  $^{36}\text{Cl}$ , are being conducted as part of a larger project to improve the accuracy of techniques employing cosmogenic nuclides.  $^{36}\text{Cl}$  production rates have been particularly difficult to calculate, partially due to the fact that there are three main production pathways for chlorine-36: spallation of potassium, spallation of calcium, and thermal neutron absorption. We are currently focusing on the potassium production pathway. Calibration rates published by different authors range from 137-228 atoms/ gram K/ year. Using data generated through the CRONUS-Earth project from Scotland, Antarctica, and Utah, independent calibration rates for potassium have been calculated. These production rates are all reasonably consistent. This is a step towards finally resolving the discrepancy between different  $^{36}\text{Cl}$  production rates, although more comprehensive examination of all production pathways will be required to provide secure production parameters.

## Li and Mg exchange between eclogite lenses and their host rocks: Evidence from isotope profiles

HORST R. MARSCHALL\*  
AND PHILIP A.E. POGGE VON STRANDMANN

Bristol Isotope Group (B.I.G.), Dep. Earth Sciences,  
University of Bristol.

(\*correspondence: horst.marschall@bristol.ac.uk)

Orogenic eclogites are samples of mafic rocks subducted to and exhumed from mantle depths. They are widely used as geochemical probes into the subducting oceanic crust, and their element and isotope budgets are thought to represent the composition of (altered) oceanic crust (AOC) modified by dehydration during subduction.

In the case of Li, some discrepancies in this simple model became apparent [1]: (i) Li abundances in a large number of eclogite whole-rock samples significantly exceed abundances in AOC; (ii) many samples show  $^7\text{Li}/^6\text{Li}$  ratios that are too low to be explained by fractionation during dehydration. Therefore, we recently argued that Li must have been introduced into orogenic eclogite bodies from the surrounding rocks, and hence that the observed abundances and isotopic compositions in eclogites are not representative for subducting oceanic crust [1].

Here, we sampled core-to-rim profiles across large eclogite blocks, to determine the scale and degree of Li exchange between eclogite lenses and their country rocks. The results show that Li concentrations and isotope ratios are disturbed at the scale of metres. One 5-m-eclogite block from Syros (Greece) shows a  $\delta^7\text{Li}$  value of +1.7 ‰ in its core, a decrease to -1.6 ‰ at a distance of 0.6 m to the rim and a strong increase to +8.1 ‰ at the contact to the surrounding serpentinite. Mg concentrations and isotope ratios are altered in the outermost 0.2 m of the block.

Given the low metamorphic temperatures of the rocks, the observed disturbances cannot be attributed to solid-state diffusion of Li and Mg into the block. Instead, they are probably related to the influx of hydrous fluids into the block along small cracks and grain boundaries during exhumation. The fluids may have provided a transport network connecting the interior of the block to the serpentinite. These pathways would have been short-lived and sealed again by hydrous minerals (chlorite, amphibole) forming along the cracks and grain boundaries. Thereafter, diffusion is again restricted to the grain scale, and the dm to m scale heterogeneities are preserved in the exhumed eclogite blocks.

[1] Marschall *et al.* (2007) *EPSL* **262**, 563-580.