## Lithium exchange between eclogite lenses and their host rocks: evidence from isotope profiles

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Lithium exchange between eclogite lenses and their host rocks: evidence from isotope profiles
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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 (Marschall et al., 2007): (i) Li abundances in a large number of eclogite whole-rock samples significantly exceed abundances in AOC; (ii) many samples show $^{7}Li/^{6}Li$ 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 (Marschall et al., 2007).
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 $\delta^{7}$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. Given the low metamorphic temperatures of the rocks, the observed disturbances cannot be attributed to solid-state diffusion of Li and other elements 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.
References
Marschall HR, Pogge von Strandmann PAE, Seitz H-M, Elliott T, Niu Y (2007) The lithium isotopic composition of orogenic eclogites and deep subducted slabs. Earth Planet. Sci. Lett., 262: 563-580.

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