Stable iron isotope behaviour during fluid release from subducted slab serpentinites

EDWARD C. INGLIS[1], PIERRE BOUILHOL[2], BAPTISTE DEBRET[3], HELEN M. WILLIAMS[3] & KEVIN W. BURTON[1]

[1]Department of Earth Sciences, Durham University, Durham, UK. (e.c.inglis@durham.ac.uk)
[2]LMV Université Clermont Auvergne, Blaise Pascal, France.
[3]Department of Earth Sciences, University of Cambridge, Cambridge, UK.

Recent work has demonstrated that the devolatilisation of subducting slab serpentinites is a viable mechanism for mobilizing Fe during subduction [*1*]. Building on this observation we have characterised a suite of high-*P* metamorphic veins from the Zermatt-Saas serpentinite body in the Swiss Alps, which we interpret to reflect fluid migration during destabilisation of hydrous antigorite serpentine during eclogite facies metamorphism. We observe two main vein paragenesises, which are classified as: 1) clinohumite-rich, and; 2) olivine-rich. Such assemblages are consistent with the partial dehydration of the antigorite host rock along a subduction zone gradient.

Whole rock trace element data for the antigorite serpentinite host shows large enrichments in fluid mobile elements [B], [As] and [Sb], which are thought to reflect interaction with externally derived fluid, likely during high pressure metamorphism. Our Fe isotope data for the antigorite + olivine serpentinite host rocks yield a mean δ^{56}Fe of -0.05 ± 0.05‰ (2sd; n = 8), which is in excellent agreement with other partially dehydrated eclogite facies serpentinites from different Alpine ophiolites [*1*], and offset towards a lighter isotopic composition than measurements of abyssal peridotites [*2*].

In addition to these whole rock measurements, we present Fe isotope data for individual vein forming phases, which have been sampled at the grain scale by micromilling techniques. Preliminary Fe isotope data for these samples shows that vein forming olivine is offset towards light isotopic values, suggesting the preferential incorporation of isotopically light Fe within chanellised fluids released during dehydration of the surrounding antigorite serpentinite.

[*1*] Debret et al., Geology (2016)
[*2*] Craddock et al., EPSL (2013)