INFLUENCE OF FLUID-ROCK INTERACTIONS ON THE IRON ISOTOPE COMPOSITION OF THE OCEANIC LITHOSPHERE

DESSIMOULIE L.[1], DELACOUR A.[1], MARIN-CARBONNE J.[1], GANNOUN A. M.[2], CHEVET J.[1], & GUILLAUME D.[1]

[1] Univ Lyon, UJM Saint-Étienne, Laboratoire Magmas et Volcans, Saint-Étienne, France, lucile.dessimoulie@univ-st-etienne.fr

[2] Univ. Blaise Pascal, Clermont-Ferrand II, Laboratoire Magmas et Volcans, Aubière, France

Iron is a good tracer of the redox conditions prevailing in a system and of the type of reactions that affect it. Seawater infiltration in the oceanic lithosphere at mid oceanic ridge leads to major changes in the chemical composition and the redox conditions of both seawater, mafic and ultramafic rocks that compose the lithosphere. Especially, serpentinization of ultramafic rocks is a process implying both hydration and oxidation of the protolith. However, the evolution of the redox conditions of the oceanic rocks from mid-oceanic ridges to subduction zones is still poorly constrained.

Here we present bulk rock iron isotope compositions of variously altered serpentinized peridotites originating from the slow-spreading South West Indian Ridge (SWIR), collected during the SMOOTHSEAFLOOR campaign (2010).

The majority of the samples are serpentinized harzburgites, with few dunites and occasionnal lherzolites, with Fe^{3+}/Fe_{total} ratio, a proxy of the serpentinization degree, ranging from 0.4 to 0.9. Their mineralogy consists in primary mineral relics (olivine, pyroxene, Cr-spinel) along with secondary phases (lizardite, magnetite, chlorite, brucite, sulfides, metallic iron, talc, tremolite, carbonates and altered plagioclases).

Bulk rock iron isotope compositions reveal that most of the serpentinites belong to the range of abyssal peridotites as defined by Craddock et al. (2013, EPSL) ($\delta^{56}Fe$ = 0.05 to 0.10 ‰). A slight positive correlation can be observed as a function of the Fe^{3+}/Fe_{total} ratio. However, a few samples show a stronger enrichment in ^{56}Fe (up to 0.2‰) and are plotting out of the main trend. This could be explained by differences in the initial iron composition of the protolith (dunite or lherzolite) that would lead to a different enrichment trend, or by the presence or absence of magnetite and hematite, two iron oxides, whose isotope composition could strongly influence the bulk rock composition.