Lawsonite veins in eclogite as an archive of subduction zone fluids from 45-80 km depth (Sivrihisar, Turkey)

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The lawsonite eclogite and blueschist terrane near Sivrihisar, Turkey, is a pristine archive of subduction zone fluids that were present in metabasaltic and metasedimentary rocks at depths of 45-80 km. Few rocks have returned from these depths in subduction zones without extensive overprinting of mineral assemblages and textures; Sivrihisar eclogite, however, contains unaltered lawsonite (lws) and other minerals that equilibrated at pressures of up to 2.5 GPa and 550 C. Major and trace element zoning of minerals in HP veins and host rocks, microstructures of minerals deformed at HP conditions, and the chemical and physical characteristic of lws-bearing veins record episodic mineral-fluid interaction during subduction metamorphism, likely at or near the slab interface with the overlying (serpentinized) mantle wedge. The margins of lws eclogite pods and layers contain networks of mm- to cm-scale veins containing lws + garnet (grt) + phengite (ph) (± paragonite). Eclogite extensively retrogressed to chlorite + epidote contains monomineralic lws veins. Lws-grt-ph veins in eclogite are rimmed by lws-grt-ph-glaucophane zones, indicating that veining occurred at least in part during decompression under lws-blueschist facies conditions. High-precision and -spatial resolution *in situ* UV laser ablation Ar/Ar dating of ph single crystals document a sequence of events, from lws eclogite metamorphism to vein formation to lws blueschist metamorphism and eclogite retrogression over the course of at least 10 million years in the Late Cretaceous.

REE distribution in granulite assemblage from lower crust of the Serre massif (Calabria-Italy)

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Two samples of mafic granulites with porphyroblastic garnet were investigated for REE distribution between accessory and major mineral phases. The granulites were affected by Variscan metamorphism which began with a compressive event around 340-350 Ma and was followed by decompressional stages between 325 Ma and 280 Ma evidenced by re-setting or new growth of zircon [1, 2]. The studied samples differ for the presence/absence of amphibole and biotite. In the sample with amphibole and scarce biotite the porphyroblastic garnet is relatively rich in REE: ∑HREE= 190 ppm at core and ∑HREE up to 702 ppm at rim. The garnet in the sample lacking amphibole shows decidedly higher REE abundances: ∑HREE=2463 ppm at core and ∑HREE up to 14784 ppm at rim. Both garnets show an increase of HREE in the peripheral zone due to consumption of the primary rim during corona formation and sequestration of REE in smaller volumes. The abundance and distribution of REE in the zircons from the two samples are comparable. They show REE fractionated patterns with Lu_N/Gd_N variable from 42.91 to 24.84. Even the orthopyroxenes from the two samples contain similar abundance of REE (∑REE from 6 to 13 ppm). The difference in REE contents in garnet seems to be connected to the presence of amphibole as major mineral phase. So the empirical REE distribution coefficients (D) between zircon and garnet are controlled by REE contents of garnet in the studied rocks and caution should be placed on the use of Dzrn/grt to infer chemical equilibrium between domains of garnet and zircon and to constrain the significance of the zircon ages.

As expected under granulite facies [3], the analysed amphibole is enriched in REE everywhere it occurs (inclusion, matrix, corona). So it appears that in the case study, the equilibrium between garnet and amphibole is indicated by the calculated DREE values which are lower than 1 from La to Dy (0.001-0.9) and higher than unity from Ho to Lu (1.5-15).

[1] Fornelli *et al* (2011) *Mineral Petrol* **103**, 101-122. [2] Fornelli *et al* (2012) *Int J Earth Sci* **101**, 1191-1207. [3] Skublov & Drugova (2003) *Can Mineral* **41**, 383-392.

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