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Metamorphic evolution of the Grt-Omp granulites from the Laghi del Frisson Layered Complex, Argentera Massif (Western Alps)

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The Argentera, the southernmost Massif of the Helvetic-Dauphinois domain of the western Alps, is part of Southern European Variscan belt and consists of a Carboniferous low pressure migmatic basement intruded by Late Carboniferous to Permian granites. It has been subdivided into two medium- to high-grade metamorphic units, named Tinée and Gesso-Stura Terrain, respectively. The two terrains are characterized by different pre-Alpine metamorphic evolutions, but both contain rare relics of high pressure (HP) and/or high temperature (HT) mineral assemblages, usually preserved within mafic rocks. The Laghi del Frisson Complex is a small body of about 0.5 km^2, which crops out in the south-eastern part of the Gesso-Stura Terrain (GST). The Complex shows a pervasive mylonitic fabric and consists of mm- to dm-thick layers of Pl-rich Omp granulite, Pl-poor Omp granulite, hornblendite, and very rare relics of coronitic metagabbro, suggesting its derivation from a former mafic layered complex. The Pl-rich Omp granulite consists of Pl, Grt, Omp, Amp, and rare Bt, and the Pl-poor Omp granulite of Omp, Grt, Amp and rare Pl. The hornblendite contains Hbl, Grt, and rare Pl. The metagabbro preserves a coarse-grained magmatic texture and consists of Pl and Omp after the former igneous Cpx. The contact between Pl and Omp is marked by a Grt corona, 0.1-0.5 mm-thick. The mylonitic structure is characterised by porphyroclasts of Omp, Grt, Amp, and Pl in a fine-grained matrix of neoblastic Amp, Pl, Cpx, Grt $\pm$ Bt. Locally, porphyroclastic Grt and Omp are partly replaced by symplectites of Amp + Pl.

The chemical composition of minerals is closely related to the host lithology, but some

common characters are observed. Porphyroclastic Cpx is always zoned, with Jd-richer cores containing rod or lamella shaped segregations of Ab $\pm$ Rt. The Cpx neoblasts in the mylonitic foliation show low or very low Jd-contents. Usually, the porphyroclastic Grt includes Rt needles and is zoned, the core being richer in Mg and poorer in Ca than the rim. The $Al^{(VI)}$ content in Amp decreases from porphyroclasts to mylonitic neoblasts.

Mineral assemblages and geothermobarometric estimates allow recognising four stages in the metamorphic evolution of the Laghi del Frisson Layered Complex. The metamorphic peak occurred under HP granulite-facies conditions ($\sim$ 830˚C and $\sim$ 1.6 GPa), and the first decompression stage at the transition between HP granulite- and amphibolite-facies conditions ($\sim$ 710˚C and $\sim$ 1.2 GPa). The mylonitic event records HT amphibolite-facies ($\sim$ 650˚C and $\sim$ 0.8 GPa), and the last retrogression stage was at LP-LT amphibolite-facies conditions.

In conclusion, this study indicates that the GST did not suffer two distinct metamorphic events, i.e. an earlier eclogite- and a later granulite-facies event, but a single metamorphic event under HP granulite-facies conditions. The age of the HP granulite is not known precisely, but petrographic and geochronologic evidence from other lithologies of the GST indicates a Silurian-Devonian age.