Textural, chemical and isotopic record of fluid-rock interactions in lawsonite-eclogite from Port Macquarie (Australia)

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The Rocky Beach Melange (RBM), located at Port Macquarie is part of the New England Orogen, which shapes the east coast of Australia. The RBM is composed of heterogeneous tectonic blocs of variable size, embedded in a serpentinite matrix and recording HP-LT conditions [1]. The age of these rocks is not well constrained with ages comprised between 470 Ma [2] and <340 Ma [3]. This contribution aims at documenting the fluid-rock interactions associated to one of the potentially oldest lawsonite eclogite rocks.

The lawsonite eclogite LMPM4 is highly heterogeneous at the mm to cm-scale. It can be divided in several domains separated or affected by different generations of veins or cracks mostly composed of carbonates, phengite and glaucophane. Lawsonite forms large, porous porphyroclasts with trace element-rich domains, which have partially been leached for their trace elements. They are associated to glaucophane in veins or to phengite-rich zones. In omphacite-rich domains, garnet porphyroclasts show a peculiar textural aspect, with many large inclusions and a chemical zoning following the inclusion patterns. In contrast, in the phengite-rich zones, garnet appears as euhedral, yet fractured, large porphyroclasts. They show a typical growth zoning for the spessartine component that is cross-cut by Mg-rich rims. Analysed by SIMS, these rims record a decrease in $\delta^{18}O$ compared to the core. By combining textural and chemical data, it will be possible to discuss the origin of this isotopic zoning in term of fluid source and metamorphic conditions.

[1] Och *et al*. (2003) *Mineralogical Magazine* **67**, 609-624.
[2] Fukui *et al*. (1995) *Tectonics* **14**, 1014-1020.
[3] Nutman *et al*. (2013) *Gondwana Research* **24**, 1038-1050.

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