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Trace elements behaviour and Nd isotopic ratios in REE-bearing accessory minerals along a metamorphic gradient: new insights from the Chugach Metamorphic Complex (Alaska)

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The study of accessory phases (e.g. trace elements concentrations and radiogenic isotopes) is nowadays a powerful tool for the understanding of geological processes such as crustal differentiation. They are the main carriers of incompatible elements in crustal rocks and play a major role in the enrichment of these elements from the lower towards the upper crustal levels. However, the impact of high-grade metamorphism and crustal anatexis on the chemistry of these accessory phases and the remobilization of their incompatible elements to higher crustal levels is not well constrained yet.

To tackle this, we have selected samples from the Chugach Metamorphic Complex (CMC) in Alaska, an Eocene accretionary prism where metapelitic and metagraywacke rocks experienced Low Pressure-High Temperature (LP-HT) metamorphism. Metamorphic ages (55-50 Ma) and P-T conditions of the CMC are well constrained [1,2] with a systematic N-S metamorphic gradient going from greenschist facies in the north (phyllites, 400–550°C) to amphibolite facies (schists, ~500–650°C) and to upper amphibolite facies (migmatites, ~650–750° C) in its southernmost part. Migmatites found in the CMC experienced anatexis >650 °C under water saturated melting conditions. In this study, we have investigated a dozen of samples collected along this metamorphic gradient to study the impact of increasing metamorphic grade up to anatexis on REE-bearing accessory minerals. In this study, we present trace element concentrations of apatite, monazite, allanite and titanite along the P-T gradient. Preliminary results show in particular that variations in some trace elements in apatite (e.g. HREE) would be more prone to record the CMC P-T gradient and partial melting process while composition of monazite is homogeneous throughout the gradient. Both whole-rock and in-situ Nd isotopic compositions on monazite and allanite in schists and migmatites were also analysed by (LA)-MCICP-MS. We found no significant difference in εNd between monazite, allanite and whole-rock, regardless of the type of rock analysed. This suggests (i) an overall homogeneity of the Nd isotopic composition above 550 °C up to crustal anatexis conditions and (ii) a mineral to whole-rock isotopic equilibrium.

[1] Gasser et al. (2012), *Lithos* 134-135, 108-122
[2] Bruand et al. (2014), *Lithos* 190-191, 292-312