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Pegmatite emplacement: insights from two-phase flow numerical modelling.

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Amongst the fluids present in lithospheric processes, silicate rich melts with their range of composition are one of the prime sources of ore on Earth. Understanding how such fluids propagate and interact with the porosity of the lithosphere is therefore of prime interest both for the long-term lithospheric deformation in relation with the weakening properties of fluids or to predict ore concentration linked or not to the chemical evolution of the melts.

Pegmatites are igneous rocks, generally with a granitic composition and characterised by a crystal growth dominated texture. They are often enriched in rare elements such as Lithium, Tantalum or Beryllium (amongst others) offering valuable ore deposit. In nature they are observed as pegmatites fields showing an internal organisation, with respect to the host rock (either magmatic or metamorphic) and the tectonic structures.
Here, we focus on the geometry of pegmatite fields using a numerical modelling approach. The numerical model allows us to resolve the formation and propagation of pipe structures in a viscous porous media also called porosity waves. We use the finite difference approach to solve the two-phase flow problem that couples a Stokes solver to predict the deformation of the porous matrix to a non-linear Darcy flow representing the pore fluid displacement (Räss et al., in prep).

We present here the first results of our study and discuss the effects heterogeneities in the host porous media and compare the statistical distribution of the modelled pipes with natural examples for the Montagne Noire and the Massif Central.

Räss, L., Duretz, T., and Y. Podladchikov. Hydro-mechanical coupled flow in deforming porous media.