EGU2020-13322
https://doi.org/10.5194/egusphere-egu2020-13322
EGU General Assembly 2020

Coupling between Thermo-Hydro-Chemical reactive transport and Gibbs minimisation: magma evolution in evolving multiphase porous media

Annelore Bessat, Sébastien Pilet, Stefan M. Schmalholz, and Yuri Podladchikov
University of Lausanne, ISTE, FGSE, Lausanne, Switzerland (annelore.bessat@unil.ch)

The formation of alkaline magmas observed worldwide requires that low degree-melts, potentially formed in the asthenosphere, were able to cross the overlying lithosphere. Fracturing in the upper, brittle part of the lithosphere may help to extract this melt to the surface. However, the mechanism of extraction in the lower, ductile part of the lithosphere is still contentious. Metasomatic enrichment of the lithospheric mantle demonstrates that such low-degree melts interact with the lithosphere, but the physical aspect of this process remains unclear. The aim of this study is to better understand the percolation of magma in a porous viscous medium at pressure (P) and temperature (T) conditions relevant for the base of the lithosphere. We study such melt percolation numerically with a Thermo-Hydro-Chemical model of reactive transport coupled with thermodynamic data obtained via Gibbs energy minimisation. We perform Gibbs energy minimisation with Matlab using the linprog algorithm. We start with a simple ternary system of Forsterite/Fayalite/Enstatite solids and melts. All variables are a function of T, P and composition of the system (C), and are computed in both the Gibbs energy minimisation and in the reactive transport code, and can therefore vary freely.