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# Pervasive melt migration in hot continental crust – numerical models

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The common view of melt transport in the continental crust involves an initial stage of percolation along grain boundaries, melt segregation into leucosomes and dykes, coalescence of small melt conduits into larger ones and quick nearly vertical melt flow leading to formation of plutons. An entirely different style of melt migration was described in the Bohemian Massif, eastern European Variscan belt. There, a sequence of metaigneous migmatites was described where veins are lacking, leucosomes are rare and relics of melt are spread along grain boundaries. Textural, geochemical and compositional variations in these rocks show that they formed due to equilibration with melt coming from an external source, and that pervasive flow along grain boundaries was the dominant mechanism of melt transport.

The question arises, at what conditions this style of melt transport can operate and what consequences the different styles of melt transport have on the crustal-scale tectonics. We address this question by means of a 2D crustal-scale model of two-phase flow using the code ASPECT (aspect.geodynamics.org). The system of pores through which the melt flows is not resolved in our model and it is described only by its permeability. A low permeability describes material with pores along grain boundaries while a high permeability corresponds to a system of leucosomes, dykes or cracks

For different material properties and thermal conditions we obtain different styles of melt migration and characteristics of the modeled crust. The melt can form a diffuse zone in the lower–middle crust, km-scale waves of high melt fraction gathering into sub-vertical channels, or a horizontal zone with high melt fraction in the middle crust. The lower crust is depleted and the middle crust is enriched in incompatible elements, and composition of the middle crust typically shows km-scale variations. The compositional variations are obtained even in the models with low permeability that corresponds to the melt percolation along grain boundaries, in agreement with the characteristics of the Bohemian migmatites.