# An experimental study of melt circulation in a poroviscous matrix

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Partial melting and the consecutive circulation of melt in the upper mantle plays an original role in the dynamics of the Earth. First, the extraction of melt is the main probe of its chemistry at mid oceanic ridges. Second, because the presence of melt modifies both the rheology and the flottability of the material, it may locally change the characteristics of convection. The study of ophiolites and the geochemical signature of MORBs reveal that the extraction of melt from the mantle does not occur simply by a pervasive porous flow but rather by a channelized flow. The mechanism of formation of these channels is a matter of debate and has been the subject of several theoretical and numerical studies since the eighties. The difficulty of an accurate description of the physics of the two phase flow involved in melt extraction is due to the uncertainty on the actual interactions at the interface between fluid and solid. As a consequence, there is no definitive choice for the best macroscopic formalism that can account for the bulk characteristics of the flow. Experimental studies provide a suitable tool to try to solve such a problem but they remain relatively scarce. In order to fill the gap, we propose a first comprehensive analogical experimental study of the circulation of a liquid in a porous and deformable matrix. The preliminary results presented here show that one can actually define two regimes of extraction for a given set of liquid and matrix, a pervasive regime (corresponding to a classical Darcy's law) and a channelized one. The transition between the two regimes is defined as a function of the properties of the matrix and of the circulating fluid, and the transport properties in the channelized regime are established as well. Both the qualitative and quantitative results of this study bear fundamental implications for the understanding of two phase flows and of their consequences for the dynamics of the zones of partial melting in the Earth.

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