

EGU21-16346

<https://doi.org/10.5194/egusphere-egu21-16346>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Mathematical modeling of the process of magma formation in the Earth's crust

Ivan Utkin^{1,2}, Yury Podladchikov^{2,3}, and Oleg Melnik^{1,2}

¹Institute of Mechanics, Moscow State University, Moscow, Russia

²Faculty of Mechanics and Mathematics, Moscow State University, Moscow, Russia

³Institute of Earth Sciences, University of Lausanne, Lausanne, Switzerland

One of the mechanisms of magma generation in the Earth's crust is the reaction of dehydration during subduction process. Water is released from subducting lithosphere which leads to the lowering of the melting temperature of mantle rock by hundreds of degrees.

In this work, we present a numerical study of the formation and rise of magma to the Earth's surface, considering partial melting and crystallization of rocks and chemical differentiation of magma. We develop a coupled model of the filtration flow of melt and magmatic fluid through deformable permeable rocks and a thermodynamic model of plagioclase melting based on Gibbs energy minimization approach. The formation of regions with a high melt concentration due to spontaneous focusing of filtration flow being the result of viscoplastic (de)compaction of the pore space is shown. The influence of mechanical properties of rocks and chemical composition of the system on the dynamics of the process is investigated.