Modelling the redistribution of radioactive elements from the mantle to the crust

J.M. SCHMIDT*, L. NOACK,

Institute for Geological Science, Berlin
*Corresponding author: julia.schmidt@fu-berlin.de

The thermal evolution of a planet's interior plays a key role in understanding its crustal formation and development processes on early Earth. To get an understanding of these processes, the differentiation of trace elements between mantle and crust is particularly important. In the past, constant enrichment factors for the redistribution of trace elements were widely assumed. However, for more precise results regarding trace element redistribution from the upper mantle to the crust, variations of pressure, temperature, composition and compatibility of the element of interest need to be taken into account.

To find out to which degree an element prefers to partition into the melt, we applied partition coefficient calculations. Because the ratio of incompatible elements in the melt is highest with small melt-fractions, varying degrees of partial melt being extracted from the solid and transported upwards towards the crust have to be considered as well. To investigate the redistribution of Earth's heat producing elements from the mantle to the surface we concentrate on K, Th and U and incorporate them into a thermodynamic convection code, which is used for modelling crust formation on early Earth. The implementation of these variations is particularly important, because otherwise mantle temperatures will be highly exaggerated.