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Magmatic underplating in continental lithosphere

Thybo, H.¹ and Artemieva, I.M.¹

¹ Geology Section, IGN, University of Copenhagen, Denmark, thybo@ign.ku.dk

Underplating was originally proposed as the process of magma ponding at the base of the crust and was inferred from petrologic considerations. This process not only may add high density material to the deep crust, but also may contribute low density material to the upper parts of the crust by magma fractionation during cooling and solidification in the lower crust. Separation of the low density material from the high-density residue may be a main process of formation of continental crust with its characteristic low average density, also during the early evolution of the Earth. Despite the assumed importance of underplating processes and associated fractionation, the available geophysical images of underplated material remain relatively sparse and confined to specific tectonic environments. Direct ponding of magma at the Moho is only observed in very few locations, probably because magma usually interacts with the surrounding crustal rocks which leads to smearing of geophysical signals from the underplated material. In terms of processes, there is no direct discriminator between the traditional concept of underplated material and lower crustal magmatic intrusions in the form of batholiths and sill-like features, and in the current review we consider both these phenomena as underplating. In this broad sense, underplating is observed in a variety of tectonic settings, including island arcs, wide extensional continental areas, rift zones, continental margins and palaeo-suture zones in Precambrian crust. We review the structural styles of magma underplating as observed by seismic imaging and discuss these first order observations in relation to the Moho.

References:

[1] Thybo, H., Artemieva, I.M., 2013. Moho and magmatic underplating in continental lithosphere. *Tectonophysics*, doi:10.1016/j.tecto.2013.1005.1032.

