Melting column modeling beneath intracontinental basaltic volcanic fields: A possible way to estimate continental lithospheric thickness

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Magma generation beneath intracontinental basaltic volcanic fields have been thought to be a simple process involving a single, homogeneous source and distinct melting degrees. During the last decade however it became clear that complex melting, mixing and fractionation processes may take place during the genesis of intracontinental basaltic magmas [1]. This implies that single melting models may not be appropriate to explain the genesis of such magmas.

We suggest that a melting column model assuming step-by-step dynamic melting would be a good estimation of how mantle melts in intracontinental settings. This model makes it possible to assume source heterogeneities, mainly caused by eclogite/pyroxenites formed from subducted oceanic crust.

If the shallowest part of the melting column reaches the stability of spinel instead of garnet, then lithospheric thickness can be estimated by the means of trace element geochemistry. As the lithosphere becomes thinner, the garnet signature of the basalts decrease, which can be quantified by a step melting column model. The spinel-garnet transition takes place at ~2,5 GPa at 1350-1400 °C [2], which limits the determination of lithospheric thickness to melting columns with p_f values between ~2,8-2,2 GPa. To reduce the effect of arbitrariness during parameterization (mainly source concentration), inverse modelling can be carried out to estimate the melting degree and the concentrations of trace elements in the source. For inversion, we used source concentration ratio method for non-modal dynamic melting.

To test our model, we calculated lithospheric thicknesses for four Neogene-Quarternary basaltic volcanic fields from the Pannonian Basin, East Central Europe. Our results indicate a slightly thicker lithosphere compared to previous, major element based calculations [3].

[1] McGee et al. (2013) *J. Petrol.* **54**, 2125-2153. [2] Klemme & O'Neill (2000), *CMP* **138** 237– 248. [3] Harangi et al. (2014*), Int J Earth Sci*., DOI 10.1007/s00531-014-1105-7.