Volatile-oversaturated magma ascending of ultrapotassic basalts from Wudalianchi-Erkeshan-Keluo (WEK) volcano field, NE China

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A volatile-free magma ascending through the lithosphere follows an adiabatic gradient of dT/dp ≈ 3.3 °C/kbar [1]. While if the magma is volatile-oversaturated, the gradient would be significantly larger than this value. Here we reconstructed a magma ascending p-T array (Fig 1) by using a clinopyroxene-liquid thermobarometer [2] and a Si activity thermobarometer [3]. The dT/dp of the ascending WEK magma is 10.8 °C/kbar, suggesting that the magma experienced fluid-oversaturation and vesiculation when it ascended through the lithospheric mantle.

The high potassium content of the basalts suggests that phlogopite exists in the source of the magma. However, phlogopite contains ~5 wt% H_2O, which is insufficient for the magma to be fluid-oversaturated at ~50 km. Thus, another volatile phase, possibly CO_2, is present in the fluid. A carbonate-bearing phlogopite garnet pyroxenite, possibly related to the stagnated Pacific slab, was a suitable source for the WEK basalts.

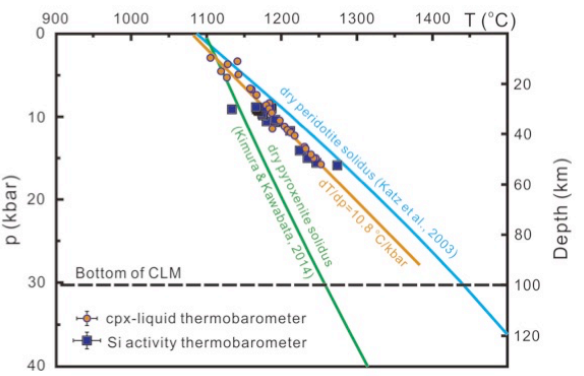

Figure 1: P-T estimates of the WEK basalts, NE China.

[1] McKenzie & Bickle (1988) *J. Petrol.* **29**, 625-679. [2] Putirka *et al.* (2003) *Am. Miner.* **88**, 1542-1554. [3] Lee *et al.* (2009) *EPSL* **279**, 20-33.