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Origin of kimberlite magma: experimental constrains
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In this presentation we discuss the compositional trend of parental kimberlite melt (Fig. 1,2), possible source regions, mechanism of the magma segregation and ascent (Fig. 3). The dissection based on our recent experimental data on the melting phase relations in the Udachnaya East kimberlite (UEK) which is unique sample of unaltered kimberlite rock (Fig. 1). The rates of the melt segregation and ascent estimated using our experimental data on diffusivity of silicate component in carbonatite melt.

Figure 1. Experimental phase diagram of unaltered Udachnaya East kimberlite (UEK). Ol ? olivine; Sp ? Al-spinel, Pv ? perovskite, Gt ? garnet; Cpx ? clinopyroxene; Ap ? apatite; Cc, Ca-carbonate, CL ? carbonatite melt. Blue lines show mantle adiabat and Udachnaya geotherm from McKenzie et al. (2005). Graphite-diamond (Gr-Dia) transition line is shown for comparison.

Figure 2. The UEK melt composition vs. P-T trend of ascent (Red dashed arrow). Grey field show approximate PT-estimations from mantle xenoliths and diamond inclusions.

Figure 3. Extraction of carbonatite melt from subducting slab. A. General view. B. close view. Since carbonatite melt rapidly infiltrates surrounding rocks, the diapir ascent rate would be controlled by pressure-solution creep in the melt impregnated layer, i.e. by silicate diffusion via intergranular melt films rather than by solid state diffusion. We expect that even small, 1 km in radius, diapirs could rise with the rate of about 0.5 m/year.

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