Evolution of silicate melt during formation a granite-pegmatite system of Malkhany pegmatite field, Russia (a case study of melt inclusions in quartz)

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The analysis of melt inclusions (MI) (homogenization conditions: 600-720°C, 200 MPa) in quartz from full row of differentiates of Malkhany granite-pegmatite system shows the following: 1. The composition of MI of granite differs from composition of whole granite considerably higher K/Na ratio, Rb, P, on the order higher contents Cs and absence of F; 2. In a process of differentiation of granite occurs decrease of contents Fe and Mg and increase of concentration Rb, Cs, Mn and P; 3. Process of melt evolution inside of magma chamber is investigated by the example of a vein Octyabrskaya: melt of coarse-grained quartz-feldspar pegmatite with schorl is similar with melt of biotite granite. In MI of quartz from miarolitic cavity in apographic pegmatite appears of F (0.32 wt.%), sharply grow K/Na ratio and contents of Cs (1.2 wt.% Cs_2O), Mn (0.3 wt.% MnO). Melt of rubellite-clevelandite-lepidolite aggregate is sharply specific: in it the low contents of Al (about 8 wt. % Al_2O_3), K (2.8 wt.% K_2O), Na (1.6 wt.% Na_2O), Cs (6.45 wt.% Cs_2O), F (2 wt.%) is established; 4. In a vein Zapadnaya contents of F (3.5 wt.% F) is established maximal for melts of object. The method of Raman spectroscopy in pegmatite melt of this object establishes extremely high concentration of B: up to 8.6±1.3 wt.% B_2O_3 in melt of veins Oreshnaya and up to 7.9±1.2 wt.% B_2O_3 in melt of veins Zapadnaya; 5. SIMS researches of melt of veins Mochovaya have shown significant similarity in levels of concentration and character of distribution REE with those for melt of Li-F granite of Orlovka massif (East Transbaikalia).

Making space for magma beneath the Jemez Mountains volcanic field: Implications for chemical diversity

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The Miocene-Quaternary Jemez Mountains volcanic field (JMVF), the site of Valles Caldera, lies at the intersection of the Jemez lineament, a Proterozoic suture zone, and the Cenozoic Rio Grande rift. The JMVF has a history of volcanism reaching back more than 20 Myr prior to the caldera-forming eruption of the Bandelier Tuff, involving magma compositions ranging from nephelinite to high-silica rhyolite. This longevity of volcanism, despite significant westward movement of the North American continent, indicates that the controls on the location of the JMVF volcanism reside within the lithosphere.

The geochemical evolution of continental magmatic systems must be considered in the light of the space problem of crustal magma chambers. Crustal magmatism can be approached from a geodynamical perspective in order to place constraints on magma segregation, storage and chemical evolution. We integrate regional structural, tectonic and geophysical data to construct a model for the emplacement and chemical diversity of the magmas found in the JMVF, culminating with the voluminous Quaternary calder-forming eruptions of the Bandelier Tuff.

Reactivation of Laramide thrust faults and the Proterozoic suture zone during rift-related extension produces low-pressure zones at releasing bends in shear zones were magma could be emplaced. The releasing bends in the shear zones are located at fault triple points representing rheologically stronger and weaker material. The existence of this rheologic variability produces an asymmetry during simple shear deformation in which the stronger material is displaced towards the weaker along one boundary and visa versa along the other. This process creates dilational, low-pressure zones into which magma can be emplaced. Magma chamber shape was controlled by syn-magmatic opening of a tensional-shear fracture allowing extensive magma-crust interaction.