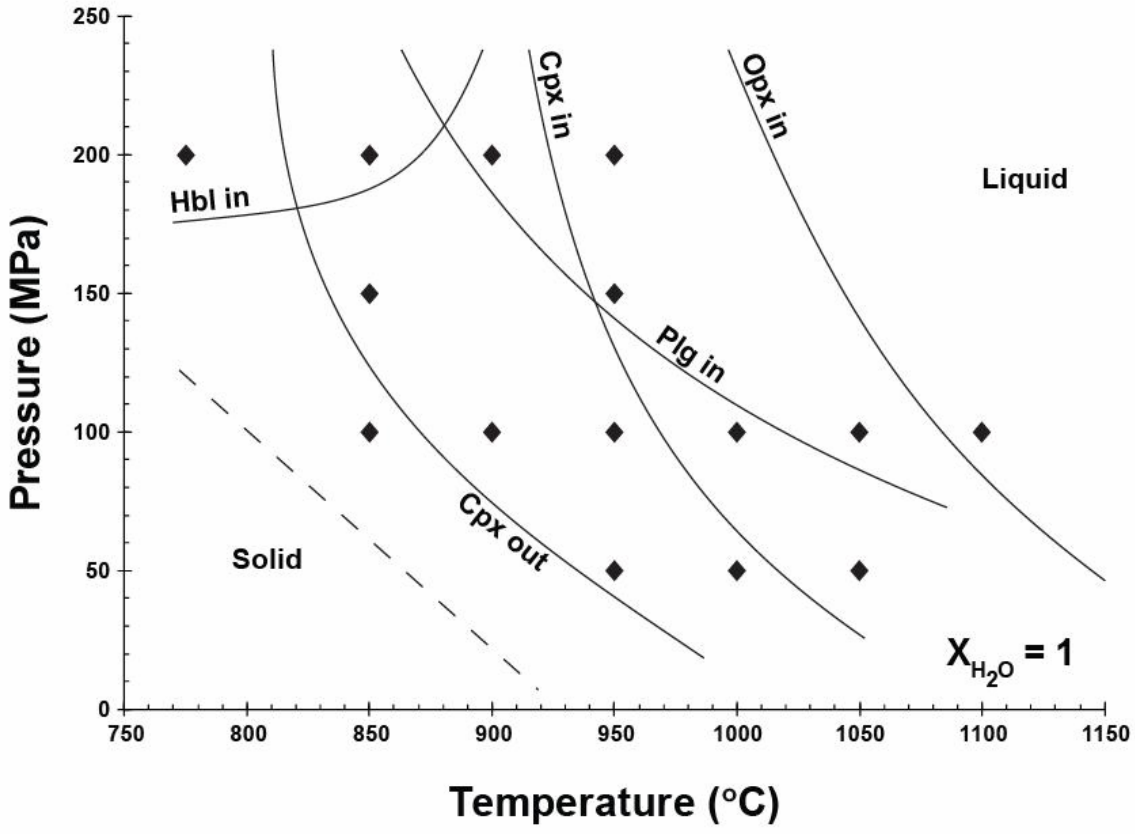
Phase equilibria constraints on pre-eruptive conditions of the 1956 Bezymianny magma

Vasily D. Shchebakov[1], Owen K. Neill[2], Pavel E. Izbekov[2], Pavel Yu. Plechov[1]
[1]Geological department of Lomonosov Moscow State University, Moscow, Russia
[2]Geophysical Institute, University of Alaska, Fairbanks, Alaska, USA

Phase equilibria experiments were conducted to constraint pre-eruptive conditions of 1956 magma. Experimental conditions were in range 775-1100°C and 50-200 MPa, water-saturated conditions and NNO oxygen buffer. Lightly crushed sample from 1956 pyroclastic flow was used as starting material. Experiments were conducted in TZM and Renee type pressure vessels, duration of the experiments varied from 8-12 h to 165 h at high-T and low-T conditions respectively.

Hornblende is stable at pressure above 200 MPa and temperature below 900°C (Figure 1).



Natural phenocrysts assemblage of 1956 andesite, which contains plagioclase, hornblende, orthopyroxene is reproduced at 850°C and 200 MPa, however clinopyroxene common in experimental run at those conditions is almost absent in natural assemblage.

Experimental glass compositions show clear variations of all major elements content with T-P conditions. Matrix glass composition is poor in CaO and MgO and SiO_2 and K_2O rich which indicates that magma last equilibrated at low pressures (less than 50 MPa). Melt inclusions composition show much wider variations comparing to matrix glass which probably indicates that magma experienced long crystallization history at wide T-P range.

Crystallization at wide range of pressures is also indicated by wide range of aluminum content in natural hornblende phenocrysts, which usually have high-Al core and relatively low-Al rim. Total range of Al_2O_3 variations is 8-14 wt. %.