V43B-3120: Magma mixing and degassing processes in the magma chamber of Gorely volcano (Kamchatka): evidence from whole-rock and olivine chemistry.

ABSTRACT

Thursday, 17 December 2015
13:40 - 18:00
Moscone South - Poster Hall

Gorely is a shield-type volcano in southern Kamchatka currently in an eruptive phase [1] with prior eruptions recorded in 1980 and 1984 [4]. It is comprised of three main structural units: ancient (middle Pleistocene) edifice called 'Old-Gorely' volcano; thick ignimbrite complex, associated with a caldera forming eruption (40 ka); modern edifice named 'Young Gorely' growing inside the caldera [6]. Gorely lavas consist of a suite of compositions ranging from basalt to rhyolite (calk-alkaline series).In this study we describe the mixing processes in magma chamber [2] based on analysis of whole-rock and mineralogical data in an attempt to compare the magma evolution pathways for 'Old Gorely' and Young Gorely volcanoes. Our results indicate that fractional crystallization (FC) is the dominant process for 'Old Gorely' magmas, while 'Young Gorely' magmas are the result of mixing of primitive and evolved magmas in Gorely magma chamber], which is located at depth range from 2 to 10 km below the volcano edifice [6].

We present results of olivine high-precision electron microprobe data analysis (20kV, 300 nA) [7], alongside traditional methods (WR diagrams, mineral zonation) to demonstrate the difference between 'Old' (FC) and 'Young' (mixing) Gorely magmas. We estimated magma H_2O (~3 wt.%) content for Gorely magma using independent methods: 1) using THI [8]; 2) using ΔT Ol-Pl [3]; 3) using Ol-Sp temperatures [9]. Additionally, calculations of [4] and analysis of olivine chemistry allow us to describe water content changes during magma evolution. We show that degassing (H_2O removal) is necessary for strong plagioclase fractionation, which is observed in Gorely evolved lavas (less than 5 wt.% of MgO).

[1] Aiuppa et al. (2012), GRL. 39(6): p.L06307.

[2] Gorbach & Portnyagin (2011) Petrology, 19(2): p.134-166.

[3] Danyushevsky (2001) JVGR, 110(3–4): p.265-280.

[4] Kirsanov & Melekescev (1991) Active volcanoes of Kamchatka, v.2: p.294-317.

[5] Mironov & Portnyagin (2011), Russian Geology and Geophysics, 52(11): p.1353-1367.

[6] Selyangin & Ponomareva (1999) J. of Volcanology and Seismology, 2: p.3-23.

[7] Sobolev et al. (2007) Science, 316(5823): p.412-417.

[8] Zimmer et al. (2010) J. of Petrology, 51(12): p.2411-2444.

[9] Wan et al. (2008) American Mineralogist, 93(7), p.1142-1147.

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