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Transition from phreatic to phreatomagmatic explosive activity of Zhupanovsky volcano (Kamchatka) in 2013-2016 due to volcanic cone collapse

Natalia Gorbach (1), Anastasiya Plechova (2), Maxim Portnyagin (2,3)

(1) Institute of Volcanology and Seismology FED RAS, Petropavlovsk-Kamchatsky, Russia, n_gorbach@mail.ru, (2) V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry RAS, Moscow, Russia, (3) GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany

Zhupanovsky volcano, situated 70 km north from Petropavlovsk-Kamchatsky city, resumed its activity in October 2013 [3]. In 2014 and in the first half of 2015, episodic explosions with ash plumes rising up to 6-8 km above sea level occurred on Priemish cone – one of four cones on the Zhupanovsky volcanic edifice [1]. In July 2015 after a series of seismic and explosive events, the southern sector of the active cone collapsed. The landslide and lahar deposits resulted from the collapse formed a large field on the volcano slopes [2]. In November 2015 and January-March 2016, a series of powerful explosions took place sending ash up to 8-10 km above sea level. No pure magmatic, effusive or extrusive, activity has been observed on Zhupanovsky in 2013-2016.

We have studied the composition, morphology and textural features of ash particles produced by the largest explosive events of Zhupanovsky in the period from October 2013 to March 2016. The main components of the ash were found to be hydrothermally altered particles and lithics, likely originated by the defragmentation of rocks composing the volcanic edifice. Juvenile glass fragments occur in very subordinate quantities. The maximum amount of glass particles (up to 7%) was found in the ash erupted in January-March 2016, after the cone collapse.

We suggest that the phreatic to phreatomagmatic explosive activity of Zhupanovsky volcano in 2013-2016 was initially caused by the intrusion of a new magma batch under the volcano. The intrusion and associated degassing of magma led to heating, overpressure and instability in the hydrothermal system of the volcano, causing episodic, predominantly phreatic explosions. Decompression of the shallow magmatic and hydrothermal system of the volcano due to the cone collapse in July 2015 facilitated a larger involvement of the magmatic component in the eruption and more powerful explosions.

[1] Girina O.A. et al., 2016 Geophysical Research Abstracts Vol. 18, EGU2016-2101, doi: 10.13140/RG.2.1.5179.4001.[2] Gorbach N.V. et al., 2015. Bulletin of Kamchatka Regional Association “Educational-scientific Center”. Earth Sciences. 3/27:5–11. [3] Samoilenko S.B. et al., 2014. Bulletin of Kamchatka Regional Association “Educational-scientific Center”. Earth Sciences. 1/23:21-26.