

# The 15 March 2019 Bezymianny Volcano Explosive Eruption and Its Products

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**Abstract**—Bezymianny Volcano is one of the most active volcanoes in Kamchatka and in the world. This paper describes the preparation, behavior, products, dynamics, and the geological effect of the March 15, 2019 explosive eruption of the volcano, which was predicted 6.5 h before it began. The sequence of eruptive events was analyzed using data provided by video and satellite-based monitoring of the volcano; the quantitative characteristics for the distribution of pyroclastic deposits were obtained in the information system “Remote Monitoring of Activity of Volcanoes in Kamchatka and the Kurile Islands”. The explosions lifted ash to heights of 15 km above sea level (up to 12 km above the volcano), the eruptive cloud was moving north-eastward and east from the volcano, the main ashfall area was 210 400 km<sup>2</sup>, including 15 000 km<sup>2</sup> on land. Apart from tephra, the eruption produced pyroclastic flows and pyroclastic surges covering an area of 30 km<sup>2</sup>. The total volume of explosive products is estimated as 0.1–0.2 km<sup>3</sup>. The eruptive rocks are calc-alkaline moderate-K basaltic andesites (SiO<sub>2</sub> = 54.84–56.29 wt %), they are the most mafic among all rocks of the current Bezymianny eruption cycle.

**Keywords:** Bezymianny Volcano, explosive eruption, KVERT, forecasting, video observations, satellite-based monitoring, VolSatView, Kamchatka

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## INTRODUCTION

Bezymianny Volcano, which is one of the more active volcanoes worldwide, is situated in the middle of the Klyuchevskoy Volcanic Group, Kamchatka (Fig. 1). Since the awakening of the volcano in 1955, it has produced 52 paroxysmal explosive eruptions, including the catastrophic event of March 30, 1956, after which the growth of a lava dome in its explosive crater went on almost without interruption until the end of 2012 (Girina, 2013; Ozerov et al., 2020). The volcano was in a relative repose during four years, from December 2012 to December 2016. This was due to a high effusive activity of the 2012–2013 Tolbachik Fissure Eruption named after the 50-year jubilee of the Institute of Volcanology and Seismology (IVS), Far East Branch, Russian Academy of Sciences (FEB RAS) and four eruptions of Klyuchevskoy Volcano in 2012–2013, 2013, 2015, and in 2016 (Girina, 2016; Girina et al., 2017d).

The period from December 2016 to mid-2018 saw viscous lava flows being squeezed out onto the southern and western slopes of the lava dome of the vol-

cano; upon this background, three strong explosive eruptions occurred hurling ash to as high as 15 km above sea level (a.s.l.) (or 12 km above the crater): March 9, June 16, and December 20, 2017 (Girina et al., 2017a–c, 2018a).

No explosive eruptions were recorded in 2018, but the lava dome remained in an active state as could be inferred from a thermal anomaly that was almost invariably observed on satellite images of the area. The anomaly had a higher temperature from March 24 through November 5, 2018 owing to the growth and existence of a new, small lava dome detected in the crater during a helicopter flight on July 9, 2018 (<http://geoportal.kscnet.ru/volcanoes/imgs/2373.jpg>). A next explosive eruption occurred at 16:10 UTC (Universal Time Coordinated) on January 20, 2019: the eruption cloud rose to heights of 7–9 km above the crater (up to 10–12 km a.s.l.) and was moving north-westward from the volcano. The ashfall area was approximately 200 000 km<sup>2</sup>, VEI (Volcanic Explosivity Index) was 2 (Girina et al., 2018c, 2019b).