

VOLUMETRIC CHANGES OF BEZYMIANNY VOLCANO

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Bezymianny Volcano, Kamchatka erupted explosively on March 30, 1956 after ca. 1000 period of quiescence. The collapse of the eastern flank of the volcano followed by a directed blast and 4-hour-long explosive activity excavated a 1.3x2.5 km horse-shoe crater open to the East. The eruption continued through extrusive activity, which by the end of the 1956 formed a 300-m-tall dome in the middle of the crater. The extrusive dome growth accompanied by frequent partial collapses and block-and-ash flows dominated through mid 70s, when short vigorous explosions from central vent followed by effusions of viscous lava flows gradually became the prevailed eruption mechanisms.

The volumetric changes of the Bezymianny dome have been measured by routine aerial surveys and stereophotogrammetry since 1956. In early 90s the observations has been interrupted due to the lack of funding. Support from the PIRE-Kamchatka project allowed us to resume Bezymianny dome aerial surveys and make three consecutive measurements on June 31, 2006, September 5, 2009, and July 24, 2010. The acquired data was used to generate high resolution digital elevation models of the dome area and to determine morphological and volumetric changes in response to the most recent eruptive activity.

Our observations indicate that by 2005-2006 a new crater formed at the summit of the dome. This crater served as a vent for each of seven explosive-effusive events that occurred during 2006-2010. Volumetric changes due to extrusive activity between early 90s and 2006 and during 2006-2010 have been minimal and only occurred in the crater area. At present the dome is entirely covered by lava flows and pyroclastic flow deposits erupted from the central vent. The average annual increase of the dome volume for the 2006-2010 period was 6.8×10^6 cubic meters. Pyroclastic deposits filled the area between the dome and the 1956 crater rim, elevated the flow of the 1956 crater, and reduced the height of the rim above the floor to 26 and 24 meters in northern and southern sectors, correspondingly. As of July 2010, the height of the dome was 2951 meters, which is still 134 meters lower than the pre-1956 height of Bezymianny.

It appears that at the end of 70s the volume of the dome became high enough to suppress significantly both endogeneous and exogeneous dome growth. Concurrently, the erupted magmas become progressively less silicic, hotter, and likely less viscous. As the result, the eruptive behavior changed and Bezymianny Volcano continued rebuilding its edifice through explosive and effusive eruptions from the central vent, as normal stratovolcanoes do.