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Submission 307

Correlating dome collapse events with block and ash flow deposits at Shiveluch volcano, Kamchatka

Shiveluch volcano in Kamchatka, Russia, is one of the world's most active dome-building volcanoes and has produced some of the largest historical block and ash flows, globally. The current eruption phase of Shiveluch volcano has been ongoing since 2001 in a cycle of dome growth and collapse. Understanding these prolonged dome growth episodes and describing the largest of these deposits to understand the extreme end of the deposit size and runout range is important for determining the maximum hazard extent of other dome collapse events. The spatial and temporal trends of eight dome eruptions and the resulting block and ash flow deposits were investigated using ASTER thermal infrared (TIR), shortwave infrared (SWIR), visible-near infrared (VNIR), and digital elevation model (DEM) data. The block and ash flows are a result of partial collapse events and their flow direction is controlled by the location of collapse on the 1,350 m-wide dome and the topography at the base of the dome. Runout distances of the largest flows extend to 18 km from the dome summit and deposited boulders with a maximum diameter of 11 m to over 11 km away. Planimetric areas of the dome collapse scars range from 0.24 to 1.71 km2. There is no correlation between scar area and deposit size, indicating that the deposit size is largely dependent on the depth of the collapse area. Maximum pixel-integrated brightness temperatures within the collapse area are recorded up to 465°C (where SWIR data is available) with the temperature decreasing rapidly towards the outer dome surface. When pre-event data are available, an increase in thermal output occurs within the area of collapse, although the areal extent of the thermal anomaly does not correlate with the size of the collapse area. Not every thermal anomaly is followed by a partial collapse. Field and satellite data show evidence of retrogressive, pulsatory collapses, in which the dome collapsed in multiple phases over the hours of the eruptions to produce one large deposit. Over the 16 years of this ongoing eruption phase of Shiveluch volcano there has been no apparent trend in aerial extent or runout distances of the flows through time, although the largest events occur when the dome is at a maximum size. Linking the block and ash flow deposit distribution and runout distance to the size, location, and temperatures of the dome collapse area provides a basis for determining the distribution and extent of future hazards at similar volcanoes.