Using photogrammetry to determine lava extrusion rates of Santiaguito dome, Guatemala

By taking advantage of zero-baseline parallax, extrusion rate measurements were extracted from high resolution (~10 cm) images taken from the same location spaced temporally to determine a time-averaged discharge rate. This method is applicable to the measurement of lava dome deformation, but it is largely untested at Santiaguito dome. Previous lava extrusion rate estimates at Santiaguito from 1922 to 1985 rely on post-emplacement flow dimensions during the entire eruption duration, and satellite-based imaging using Landsat TM and ETM+ from 1985 to 2000 which give large-scale measurements nearly once each year. Spatial resolution is much higher when using ground-based images while satellite-based images are confined to 30m, 60m, and 120m pixels, and the technique used in this study has the added advantage of focusing on one local portion of the lava flow to find short-term flux variations near the flow origin. In January 2009, two high resolution cameras were placed on the summit of Santa María volcano in Guatemala for a total of four days. The cameras collected a combined total of 32 hours of video and captured 12 explosions. Image pairs from the same camera were orthorectified to produce lava block velocity maps which demonstrate the flow paths of lava blocks over the course of one day.