

## **Soufrière Hills Volcano, Montserrat, Phase V 2009-10: Interpretation of thermal imagery of the lava dome**

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Phase V of the Soufrière Hills Volcano (SHV) andesitic lava dome eruption lasted from October 2009 to February 2010. This phase was entirely exogenous and ended with a series of Vulcanian explosions and a partial dome collapse. Activity was cyclical with most of the extrusion occurring during periods of elevated seismicity several hours apart. On 30 December 2009, an unusually cloud-free day, a series of thermal images of the upper part of the lava dome were obtained from a helicopter with a FLIR SC-640 handheld, high-resolution thermal infrared camera. Thermal images of the lava dome were superimposed on simultaneously acquired visible images for analysis and correlation.

At the time of the survey flight there was a distinctive vent, partly surrounded by an ash rampart on the south side of the lava dome summit, and a flow lobe extending from the vent to the northeastern edge of the summit platform. The active face of the extruding shear lobe was located above the north and northeast sides of the lava dome, generating numerous rockfalls and block-and-ash flows in those directions. A large inactive flow lobe covered the south flank of the dome.

On thermal images the inactive south lobe had surface temperatures of 40-60 °C, with fracture temperatures up to 355 °C. The small spiny dome occupying the crater had a maximum observed temperature of 380 °C. The active lobe flowing east-northeastwards towards the edge of the dome was bounded on the south side by a levee and appeared to be several tens of meters thick immediately above the active rockfall and block-and-ash flow source areas. Temperatures in freshly exposed headwalls above chutes leading into the drainages below had temperatures up to 420 °C. Interestingly the highest temperatures observed were not associated with active extrusion but with fumaroles. A particularly vigorous fumarole was located immediately above the saddle between the 2006-07 and the 2009-10 lobes. Its maximum temperature was 550 °C. Another fumarole midway between the saddle fumarole and the crater rim reached 495 °C. Older parts of the SHV dome not active during Phase V such as the 2006-2007 Phase III lobe had surface temperatures of 25-30 °C.