



Observations of dome growth and lava flow development as determined by pixel offsets in photographs of the 2006 Merapi eruption

Thomas R. Walter (1), Antonius Ratdomopurbo (3), Subandriyo Subandriyo (2), Nurnaning Aisyah (2), Kirbani Sri Brotopusptio (4), Jacqueline Salzer (1), and Birger Lühr (1)

(1) GFZ Potsdam, 2.1, Potsdam, Germany (twalter@gfz-potsdam.de), (2) Volcano Technical Research Center (BPPTK), Jalan Cendana 15, Yogyakarta 55166, Indonesia, (3) Earth Observatory of Singapore, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, (4) Laboratory of Geophysics, Department of Physics, Faculty of Mathematics and Natural Science, Universitas Gadjah Mada (UGM), Yogyakarta, Indonesia

Viscous domes of explosive volcanoes commonly form by extrusion and are destroyed by collapses of the talus region. Although the growth and development of silicic domes and the associated flow and collapse mechanisms are of vital importance for understanding the occurrence and scale of pyroclastic flows, quantitative measurements of dome deformations are limited. We report on a sequence of photographs taken of a growing and deforming dome. Photographs of Mount Merapi in 2006, taken from similar camera positions, allow a digital image correlation algorithm to be applied to detect and explore the temporal evolution of pixel offsets. The results suggest that the dome underwent deformation in two regions between September and October 2006: (i) dome growth and spreading at the volcano summit and (ii) coulée flow through a narrow canyon. The latter is associated with strain localization and flow acceleration, which indicates that the displacements and flow velocities at silicic domes are governed by the topographic structure into which the flows develop. The downslope motion of the distal parts of the flow and apron slumps continue during episodes of dome extrusion by gravitational spreading. An analysis of the 2006 Merapi dome and coulée displacement also provides insights into processes of the newly established southerly eruption direction, which also controlled the 2010 eruption.