Geophysical Research Abstracts
Vol. 14, EGU2012-2089, 2012
EGU General Assembly 2012

Low Cost Volcano Deformation Monitoring: Optical Strain Measurement and Application to explosive Volcanoes

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Through spatial digital image correlation (DIC) analysis of camera images, a new deformation monitoring technique is introduced into volcanology. Our results are providing evidences that the strain rate of extruding volcanic domes is highly variable in space and time. DIC yielded cumulative and incremental displacements, strain and shear planes at decimeter resolution. It was found that dome extrusion rates are highly non-linear, decelerating prior to partial collapse, followed by a pronounced dome extrusion increase and direction change. Associated processes have been identified through DIC, such as shallow landslides and reworking of talus apron material. The presentation provides examples from Mount St. Helens, Colima and Merapi, and highlights the strengths of camera strain monitoring.