



Continuous deformation monitoring of Merapi using optical and microwave tools

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Deformation monitoring at volcanoes is an important tool to determine the hazard potential of the volcano. Beside punctual monitoring methods as trilateration, triangulation and GPS, remote sensing tools allow to determine the areal deformation of the volcano edifice. Spaceborne InSAR technique is a well known application for this task. Nevertheless, the high temporal and spatial resolution and the processing delay of spaceborne techniques might be a problem at high-risk volcanoes.

It is therefore proposed to install a hybrid ground based deformation monitoring system at Merapi volcano, to get a higher temporal and spatial resolution. The idea is to combine optical images taken by digital cameras and line-of-sight displacements recorded by a ground based SAR device (GB-SAR). The fusion of both sensors allows a continuous recording of the deformation status of the volcano.

The GB-SAR records under all circumstances (day and night, clouds) displacements with very high resolution (0.1 mm) and accuracy (1mm). Using an automated processing algorithm based on the Persistent Scatterer technique the deformation of the volcano in line of sight is available in almost realtime.

The installation of two calibrated web cameras allows – if the volcano is visible – the determination of 3D deformations using the Digital Image Correlation technique (DIC). Achievable resolution and accuracy are in the range of centimeters.

The paper illustrates the basic principles and shows the results gathered with a GB-SAR at an active volcano on the Azores. It also deals with the selection of an appropriate installation location using a detailed DTM.