



TerraSAR-X based image analysis for supporting disaster and crisis-management with respect to the 2010 volcanic eruption at Mt. Merapi (Java - Indonesia)

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This work demonstrates how Synthetic Aperture Radar (SAR) image analysis can successfully be used for supporting disaster and crisis-management concerning volcanic eruptions. In October/November 2010 the strato-volcano Mt. Merapi erupted leading to about 300 deaths and more than 380 000 refugees. Satellite imagery can be a very useful source to derive rapid crisis information for post-disaster relief efforts. Modern, space borne radar sensors like TerraSAR-X can deliver very high resolution remote sensing data, at almost any weather condition, with a fast site access time. Little work has been done in detection of pyroclastic flow deposits by using very high resolution SAR. To increase the knowledge in that issue this work has been realized.

The TerraSAR-X images used in this work were acquired on 26 October 2010 and 6 November 2010 in StripMap Mode with a ground resolution of three meters. Change detection analysis is performed for supporting semi-automated image classification. This is done by using multitemporal color-composites, normalized change and interferometric coherence indices. Subsequently, the disaster extent is mapped by an object-based image analysis, using the software eCognition. Based on the disaster extent map, a damage assessment is performed by an intersection operation which employs governmental land-use maps. Finally, the SAR-based image analysis results are validated with optical imagery. A WorldView image, acquired on 11 November 2010, is used for this reason. The validation shows a close agreement between the SAR and the optical-based disaster extent, concerning the inner part of the pyroclastic flow deposit. The outer part with burnt leaves but still existing tree trunks was well detected by the optical sensor, but poorly with the SAR sensor.

In summary, the presented methods make it possible to rapidly map the disaster extent and to perform a damage assessment in order to assist disaster and crisis-management concerning volcanic eruptions.