Satellite observations as a tool to monitor the volcanoes of...

Elske de Zeeuw - van Dalfsen, Anouk Korevaar, Freek van Leijen, Reinoud Sleeman and Diego Coppola

1 The Royal Netherlands meteorological Institute (KNMI), Netherlands, dalfsen@knmi.nl
2 Department of Geoscience and Remote Sensing, Delft University of Technology, Delft, The Netherlands
3 Department of Earth Sciences, University of Turin, Turin, Italy

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Lesser Antilles volcanic arc has 17 active volcanoes
Volcanism due to ongoing subduction
Montserrat started to erupt in 1995 after centuries of quietness.
Martinique experienced 5th deadliest volcanic eruption in 1902
Mnt. Scenery on Saba erupted ~1640
The Quill on St. Eustatius erupted ~400

→ Monitoring Mnt. Scenery and the Quill is important
→ Currently only ground-based monitoring

Which Satellite observations are feasible to add to the existing ground-based monitoring network?
Preliminary InSAR

- InSAR observations can be used to monitor surface deformation of volcanoes.
- Large spatial coverage over longer time periods can make subtle signals visible.
- Problem is the loss of radar coherence caused by tropical rain forest.
- And the steep slopes which result in layover and shadowing effects.
- We process ALOS-2, PAZ and Sentinel data.

Preliminary ALOS-2 L-band satellite interferograms in radar coordinates, for St. Eustatius (left) and Saba (right). Coherence is fair, but temporal resolution low for monitoring purposes.
MODIS (Moderate Resolution Imaging Spectroradiometer) data are used by MIROVA (Middle Infrared Observation of Volcanic Activity) to detect, locate and quantify thermal anomalies in near real-time (www.mirovaweb.it).

Automatic triggering is challenging as Saba is a very small island (12 km$^2$). False positives may occur due to the large contrast between the sea and island. Therefore observations are still in a test phase. As expected, currently no real anomalies have been observed.
Satellite monitoring can be complementary to ground-based observations.
- It does not require local presence nor instruments.
- It is independent from local data transmission.
- The temporal resolution has increased in past years as more satellites have launched.

But...
- The sensitivity is not always good enough, especially considering the size of the islands (13 and 21 km²).
- Data availability sometimes depends on data proposal opportunities of space agencies.

However...
- First steps have been made to implement satellite data for monitoring of Mnt. Scenery and the Quill.
- More work is needed before combined monitoring can be made operational for these volcanoes.