



## Satellite observations as a tool to monitor the volcanoes of Saba and St. Eustatius

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The Dutch islands of Saba and St. Eustatius are located in the far north of the Lesser Antilles arc, a subduction zone hosting seventeen active volcanoes. The volcanoes of Saba and St. Eustatius: Mount Scenery and The Quill, are currently monitored using a ground based network, operated by KNMI, comprising broadband seismometers, continuous GNSS stations and a temperature sensor in the hot spring on Saba. Satellite observations are complementary to these ground based measurements and are especially useful for these volcanoes as they are located in a remote area.

InSAR observations can be used to monitor surface deformation of volcanoes. Because considerable areas are observed with each satellite passing, subtle signals, which may be missed by continuously recording ground based GNSS stations, may be picked up. However, research using TerraSAR X-band and Sentinel-1 C-band data in the Caribbean region has shown that monitoring with InSAR is hampered due to the loss of radar coherence caused by tropical rain forest covering the Caribbean islands. Moreover many of the islands have steep slopes resulting in layover and shadowing effects. We generate interferograms and time series of ALOS-2 L-band data and Sentinel C-band data to identify which mission is more suitable for long term monitoring of the volcanoes on Saba and St. Eustatius.

The Terra satellite carries five instruments that take coincident measurements of the Earth system, among those is MODIS: a Moderate Resolution Imaging Spectroradiometer. MODIS data are used by MIROVA (Middle Infrared Observation of Volcanic Activity): an automatic volcano hot spot detection system, able to detect, locate and quantify thermal anomalies in near real-time, by providing, infrared images and thermal flux time-series on over 200 volcanoes worldwide ([www.mirovaweb.it](http://www.mirovaweb.it)). A volcano in a non-eruptive state such as Mount Scenery on Saba would typically be checked on a monthly basis. As Saba is a very small island (12 km<sup>2</sup>) automatic triggering is challenging and therefore observations are still in a test phase.

Satellite observations can be a useful addition to the ground based monitoring of small island volcanoes although small adaptations to currently used techniques may be needed. As such they may be crucial for timely warning of local authorities in case of unrest at a remote volcano.

