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The installation and operation of a multi-parameter volcano monitoring network on the islands of Saba and St. Eustatius in the Caribbean Netherlands

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In the Caribbean Netherlands, the islands of Saba and St. Eustatius host the active but quiescent volcanoes Mt. Scenery and The Quill. To mitigate volcanic risk to the islands, robust monitoring is essential. Therefore in the past five years the Royal Netherlands Meteorological Institute (KNMI) significantly expanded the volcano monitoring network on both islands.

The seismic monitoring network was expanded from seven to 11 broadband seismometers located across the islands. Seismic data are sent to and stored at KNMI and Observatories and Research Facilities for European Seismology (ORFEUS). Eight permanent continuous Global Navigation Satellite System (GNSS) stations were newly installed, where possible co-located with the broadband seismometers. GNSS data are sent to and stored at KNMI and UNAVCO. On a daily basis we run an automatic earthquake detection system and coincidence trigger to identify seismic events and create GNSS time series using both network and Precise Point Positioning (PPP) solutions.

The installation of new instruments was challenging due to the remoteness of the envisioned locations which were needed to monitor all sides of the volcanoes. Local governmental and military assistance was key to the success of the mission. At the most remote locations instruments are operated on solar power and data are transmitted using Very-Small-Aperture Terminal (VSAT) technology. Ensuring the operability of the monitoring network remains demanding due to the harsh tropical conditions (hurricanes, UV-radiation, sea spray, lightning) as well as network and power outages.

Apart from seismic and GNSS instruments, we also deploy three temperature sensors and four cost-effective GNSS units to extend our monitoring network. Furthermore, in collaboration with Delft University of Technology (TU Delft) we test the feasibility of the use of Interferometric Synthetic Aperture Radar (InSAR) for the monitoring of these islands.