

EGU23-7122, updated on 30 Mar 2023 https://doi.org/10.5194/egusphere-egu23-7122 EGU General Assembly 2023 © Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



The use of cost-effective GNSS units as a volcano monitoring tool on Saba, Caribbean Netherlands

Andreas Krietemeyer, Elske de Zeeuw-van Dalfsen, and Reinoud Sleeman R&D Seismology and Acoustics, Royal Netherlands Meteorological Institute, De Bilt, Netherlands (andreas.krietemeyer@knmi.nl)

We present initial positioning results obtained by analyses of data from four cost-effective Global Navigation Satellite System (GNSS) units installed on the island of Saba. The island hosts the active but quiescent stratovolcano Mt. Scenery which reaches an elevation of 887 metres and was last active around 1640. The cost-effective GNSS units were installed around the volcano in February 2022 and house all necessities for autonomous, continuous monitoring. The overall equipment cost per unit is about 1000 Euros, a fraction of the material costs of a conventional, permanent continuously monitoring GNSS station. Furthermore, the typical installation time of permanent stations takes multiple days whereas the installation time required for our cost-effective units can be undertaken within a few hours. We demonstrate that the performance of the cost-effective GNSS units for daily positioning estimations is comparable with the performance of permanent stations. We investigate the precision and accuracy of the time series of kinematic and static positioning solutions using geodetic positioning estimation algorithms. For direct comparison we placed one cost-effective GNSS unit next to a permanent, conventional GNSS station. Furthermore, we investigate if results improve after applying a minimum-effort calibration of the cost-effective antenna using a permanently installed GNSS station. We demonstrate that cost-effective GNSS units are i) well-suited to extend an existing volcano monitoring network of permanent GNSS stations and ii) can potentially even be used independently for basic volcano monitoring when funding is limited. We also envisage the use of cost-effective GNSS units for rapid deployment in hazardous or risk-prone areas where installations of conventional GNSS stations could be deemed too costly.