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Monitoring of Indonesian Volcanoes with I06AU infrasound array

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Detecting and notifying ongoing volcanic explosive eruptions can support the activities of the Volcanic Ash Advisory Centres (VAAC) in their contribution to the International Airways Volcano Watch. However, local monitoring systems are missing on many active volcanoes. Here, the use of a global monitoring that, even with lower reliability, can allow a fast response. Many studies have shown so far the utility and potential of long-range infrasound monitoring for this aim, but still open questions remain concerning the real efficiency and reliability of such a system.

In this study we investigate the potential of the infrasound network of the International Monitoring System (IMS) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) to detect volcanic explosive eruptions at large distances. We apply a procedure based on the Infrasound Parameter (IP) calculated from a single array to selected volcanoes by accounting for realistic infrasound propagation conditions.

The procedure was applied to data recorded by the I06AU infrasound array (Cocos Island) between January 2012 and December 2019 and targeting Indonesian volcanoes at source-to-receiver distances ranging between 1000 and 2000 km, where activity from 11 volcanoes was reported in the period of analysis with an energy spanning from mild explosions to VEI4 eruptions.

The system reliability was evaluated from the ratio between real ones and the total number of notifications provided from I06AU array for each volcano.

The IP was calculated following previous studies and improved with new constraints accounting for the source strength and signal persistency. These allowed us to improve significantly the system reliability for events VEI3 or greater and strongly reduce the number of false alerts. Still, undetected explosive events remain due to unfavorable propagation conditions and unresolved ambiguity due to short spacing among volcanoes with respect to the array. We propose to solve this last issue by considering volcanic sectors rather than single volcanic edifices. Instead of a notification for a single volcano, an alert for an area of interest could be issued to draw the attention and trigger further analysis of satellite images by the VAACs.

This study is performed to improve the Volcanic Information System (VIS) proposed and developed in the framework of FP7 and H2020 ARISE projects.