EGU22-1151
EGU General Assembly 2022

A machine learning method for seismic signal monitoring: A contribution to the detection of the potential volcanic hazard on Etna, Italy

Susanna Falsaperla, Horst Langer, Alfio Messina, and Salvatore Spampinato
Istituto Naz. Geofis. Vulcanol., Sezione di Catania, Osservatorio Etneo, Catania, Italy (susanna.falsaperla@ingv.it)

The dynamics driving an eruption play a crucial role in the impact volcanic activity has on the community at large. The interpretation of geophysical and geochemical changes heralding a volcanic unrest is a fundamental key to forecasting upcoming phenomena. However, the style and intensity of the eruption are difficult to predict, even in open-conduit volcanoes where eruptions can be relatively frequent. This is the case of Etna, in Italy, one of the most active basaltic volcanoes in the world. In 2021, fifty-two lava fountains arose from its Southeast Crater accompanied by lava emissions and ash fallout, which disrupted air and road traffic in numerous Sicilian municipalities. Lava fountains are just one of the typical eruptive styles of Etna. Strombolian activity and lava flows are also relatively frequent here, each with its own characteristics in terms of intensity and social impact.
We developed a machine learning (ML) method for the analysis of the seismic data continuously acquired by the local stations of the Etna permanent seismic network, exploiting the spectral characteristics of the signal. Its design started from: i) the need to detect the volcanic hazard, and ii) provide timely and indicative information on possible eruptive scenarios to the Civil Protection and the Authorities. Besides the identification of anomalies in the data, which flag enhanced volcano dynamics in its early stages, we investigate on clues concerning the potential intensity level of eruptive phenomena. The method works in near real time and can effectively contribute to the multidisciplinary analysis of volcanic hazard.