



## **Unsupervised clustering of infrasonic events at Mount Etna using DBSCAN and SVM**

Marco Aliotta (1,2), Andrea Cannata (1), Carmelo Cassisi (2), Placido Montalto (1,3), Eugenio Privitera (1), and Alfredo Pulvirenti (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania (cannata@ct.ingv.it), (2) Università degli studi di Catania, Dipartimento di Matematica e Informatica, (3) Università degli studi di Catania, Dipartimento di Ingegneria Elettrica Elettronica e dei Sistemi

Active volcanoes effectively generate sonic and infrasonic signals, whose investigation provides useful information for both monitoring purposes and study of the dynamics of explosive phenomena. At Mt. Etna volcano (Italy) a clustering algorithm based on infrasonic waveform features has been developed. It allows to recognize the active vent with no location algorithm and by using only one station. Firstly by a parametric power spectrum method we extract the features describing and characterising the infrasound events: peak frequency and quality factor. Then, we consider such features together with the amplitude in a 3D “feature space” and by making use of DBSCAN algorithm (Density-Based Spatial Clustering of Applications with Noise) we identified the main clusters inside it. After the clustering process, by using a traditional location method (semblance method) together with a visual inspection of the video camera images, we were able to associate each cluster to a particular source vent and/or a kind of volcanic activity. Next, clusters were used to train a model based on Support Vector Machine (SVM) for the for automatic event location.