Catalog of the seismic activity in and around the island of Vulcano, Italy, between 1985 and 2019

Type Dataset**Class type** Dati Sismologici e Infrasonici (terrestri e marini)

Earthquakes Seismic Events Related To Fluid Dynamic Vulcano Seismic Activity

Since the end of its last eruption in 1890, the island of Vulcano, Italy, has experienced episodes of volcano unrest marked by anomalous values of geochemical and geophysical parameters. The last episode, which began in September 2021, caused great concerns due to the potential trigger of eruptive activity, with serious consequences on the local population and tourists. To contextualize the anomalous variations recorded, it was necessary to search for reference catalogs reporting data on decade-long time spans. Focusing on seismic activity, we have prepared a catalog that collects data on seismic events originating on the island of Vulcano and its surroundings in a wide time window, starting from bulletins, reports, and scientific articles from the 1980s. By doing so, we provide the first quantitative framework useful as a contextual reference of seismicity and its variations over time. Consequently, this catalog contains various datasets - from the counting of seismic events linked to fluid dynamics in the shallow hydrothermal system to the localization of earthquakes. For a description of the various types of local events recorded at Vulcano we address interested readers to e.g., Falsaperla and Neri, 1986; Montalto, 1994; Alparone et al., 2010; Cannata et al., 2012. For continuity and reliability of information, the datasets in this catalog cover the years from 1985 to 2019 and encompass: 1) hourly occurrence frequency of the seismic events (mostly local microshocks of volcanic origin) that exceeded an amplitude threshold (20 mm) on the paper seismograms of a reference station. The station for the counting was named VCR until mid-2004 and IVCR ever since. It is located at Forgia Vecchia, close to a large fumarole field. The dataset covers the years from 1985 to 1999 (see file Events-IVCR_hourly_freq_1985-1999.csv); 2) hourly occurrence frequency of the seismic events with origin within a radius of 10 km around "La Fossa di Vulcano" crater (Montalto and Neri, 1993). These events were recorded at least at three stations in the Lipari-Vulcano area. The dataset covers the years from 1985 to 1999 (see file Events-LIVU_hourly_freq_1985-1999.csv); 3) earthquakes from 1985 to 2019 with magnitude greater than 2.5, located in a geographical region encompassing the Lipari-Vulcano complex (coordinates: latitude from N38.265° to 38.540°, longitude from E14.780° to 15.130°). In the following, the description of each dataset: • Earthquakes_1985-2019.csv: For each earthquake the dataset provides the hypocentral parameters (UTC origin time, latitude, longitude, depth, gap and location errors when available), duration magnitude (Md) and local magnitude (ML); • N_earthquakes_and_strain-release_per_day_1985-2019.csv: Daily number of earthquakes and strain release. A column reports the cumulative value of strain release over time; 4) seismic swarms in 1985 and 1988 related to important episodes of volcanic unrest at Vulcano. The catalog encompasses the following datasets: • 1985_seismic_swarm.csv: Hypocentral parameters (UTC origin time, latitude, longitude, and depth when available), and duration magnitude (Md). This dataset refers to the seismic events, mainly located in the island of Vulcano, with duration magnitude between 1 and 2.3, recorded from April to August 1985; • N_events_and_strain_release_per_day_seismic_swarm_1985.csv: Daily number of seismic events and strain release. A column reports the cumulative value of strain release over time. This dataset refers to seismic events recorded from April to August 1985. • 1988_seismic_swarm.csv: Hypocentral parameters (UTC origin time, latitude, longitude, and depth when available), and duration magnitude (Md). This dataset refers to seismic events, mainly located in the island of Vulcano, with duration magnitude between 1.8 and 2.5, recorded from July to September 1988. • N_earthquakes_and_strain_release_per_day_seismic_swarm_1988.csv: Daily number of earthquakes, and strain release. A column reports the cumulative value of strain release over time. This dataset refers to seismic events with magnitude between 1.8 and 2.5, recorded from July to September 1988.

Note that our catalog also includes datasets from Falsaperla (2021, 2022) concerning seismic events at Vulcano in 1988. Detailed descriptions of seismic activity during the 1985 and 1988 volcanic unrests can be found in e.g., Falsaperla and Neri, 1986; Chiodini et al., 1992; Falsaperla, 2021.

Acknowledgements We thank all the technical and scientific staff who contributed in various forms to the acquisition of information over the years. We also sincerely thank Graziella Barberi for her availability and expertise in contributing to the data collection. This catalog has been developed in the framework of the Pianeta Dinamico 2023-2025 WUnderVul Project, Progetto Dipartimentale INGV.

Cite as

> Falsaperla S., Spampinato S., Cocina O. M. G. (2023). Catalog of the seismic activity in and around the island of Vulcano, Italy, between 1985 and 2019 (Version 1) [Data set]. Istituto Nazionale di Geofisica e Vulcanologia (INGV).

https://doi.org/10.13127/vulcano/seismicity_1985-2019

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Version	1
Dataset Identifier (DOI)	10.13127/vulcano/seismicity_1985-2019
Acronym	Vul1985_2019
Publisher	Istituto Nazionale di Geofisica e Vulcanologia (INGV)
Release Date	01-01-2023
Temporal Coverage	From 01-01-1985 until 31-12-2019
Rights holder	Istituto Nazionale di Geofisica e Vulcanologia (INGV) ROR 00qps9a02 IPA ingv
Update frequency	never
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