Concurrent eruptions at Etna, Stromboli, and Vulcano: casualty or causality?

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Abstract
Anecdotes of concurrent eruptions at Etna, Stromboli, and Vulcano (Southern Italy) have persisted for more than 2000 years and volcanologists in recent and past times have hypothesized a causal link among these volcanoes. Here this hypothesis is tested. To introduce the problem and provide examples of the type of expected volcanic phenomena, narratives of the most notable examples of concurrent eruptions are provided. Then the frequency of eruptions at each individual volcano is analysed for about the last 300 years and the expected probability of concurrent eruptions is calculated to compare it to the observed probability. Results show that the occurrence of concurrent eruptions is often more frequent than a random probability, particularly for the Stromboli-Vulcano pair. These results are integrated with a statistical analysis of the earthquake catalogue to find evidence of linked seismicity in the Etnean and Aeolian areas. Results suggest a moderate incidence of non-random concurrent eruptions, but available data are temporally limited and do not allow an unequivocal identification of plausible triggers; our results, however, are the first attempt to quantify a more-than-2000-years-old curious observation and constitute a starting point for more sophisticated analyses of new data in the future. We look forward to our prediction of a moderate incidence of concurrent eruptions being confirmed or refuted with the passage of time and occurrence of new events.

Key words *Etna – Stromboli – Vulcano – eruption, and earthquake*

1. Introduction

Earthquake-eruption and eruption-eruption triggering mechanisms are the subject of intense debate and represent the new frontier for several geophysicists and volcanologists (Kanamori and Givens, 1982; Kimura, 1996; Brodsky *et al.*, 1998, 2000; Gudmundsson and Brenner, 2003; Marzocchi *et al*., 2004; Gudmundsson, 2006; Feuillet *et al.*, 2006; Madonia *et al*., 2008). In recent years, a few case histories of eruptions that triggered earthquakes (Jacques *et al.*, 1996; Azzaro *et al.*, 2001; Walter and Amelung, 2006) or other eruptions (Miklius and Cervelli, 2003; Gudmundsson and Andrew, 2007), and of eruptions that hindered earthquakes (Walter and Amelung, 2004) have been reported. In contrast, several case histories of large earthquakes that triggered eruptions at near or remote volcanoes are now well documented (Carr, 1977; Marzocchi *et al.*, 1993, 2002, 2004; Barrientos, 1994; Linde and Sacks, 1998; Nostro *et al.*, 1998; Manga and Brodsky, 2006; Cigolini *et al.*, 2007; Harris and Ripepe, 2007; Lemarchand and Grasso, 2007; Manga, 2007; Mellors *et al.*, 2007; Walter and Amelung, 2007; Walter *et al.*, 2007).

Eruptions triggering other eruptions at the Southern Italian volcanoes (*i.e.*, Etna and Aeolian volcanoes, fig. 1) have been speculated since at least the 1st Century BC (Diodorus

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Siculus in Bibliotheca Historica). Julius Solinus (in Collectanea Rerum Memorabilium, 4th Century AD) wrote that there should have been subterranean conduits that linked and fed these volcanoes. de Dolomieu (1783) also hypothesized direct feeding relationships between Etna and the Aeolian volcanoes, whereas Mercalli (1879, 1888) supposed an indirect physical (*i.e.*, dynamic) link between these volcanoes. Recently, Cigolini *et al.* (2007) provided evidence of linked volcanic phenomena at Etna and Aeolian volcanoes during 2002-2003.

Although Southern Italy is seismically active and several M≥7 earthquakes were recorded in historical times (Boschi *et al*., 1997; Neri *et al.*, 2006; Basili *et al*., 2008), eruptions at Etna, Stromboli, and Vulcano triggered by large nearby earthquakes are not known. In particular, the six largest historical earthquakes (with epicentral MCS intensity≥IX) of eastern Sicily and southern Calabria (fig. 1) were not shortly followed by significant eruptions from the nearby volcanoes (table I), which, therefore, provide valuable case histories to study eruption triggers alternative to large nearby earthquakes (Sharp *et al.*, 1981).

This paper searches for evidence for a link between eruptions at Etna, Stromboli, and Vulcano. Our hypothesis is that concurrent activity at these volcanoes may occur at a frequency higher than expected based on the background rate. This hypothesis is explored in three different ways. The eruption catalogue is statistically analysed. The statistical method has the advantage of being quantitative, but the disadvantage of providing little insight into the plethora of behaviour that can fall under the heading of eruption. To fill out this story and provide examples of the type of phenomena expected, narratives of the most notable examples of concurrent activity are provided. Finally, the catalogue of instrumentally-recorded earthquakes is analysed to find evidence of linked seismicity in the Etnean and Aeolian areas. This paper extends previous studies on analogous subjects (*e.g*., Mulargia *et al*. 1985; Nercessian *et al*., 1991; Cardaci *et al*., 1993). Moreover, the problem of possible links between concurrent eruptions at nearby volcanoes has been previously studied in other regions (*e.g*., Klein, 1982; Bebbington and Lai, 1996).

2. Geological setting

Etna and Aeolian volcanoes (fig. 1) are located along the active convergent margin between the African and Eurasian plates in the central Mediterranean region (Malinverno and Ryan, 1986). A narrow remnant of the Ionian

Table I. Largest historical earthquakes of Sicily and southern Calabria (southern Italy, fig. 1) and subsequent eruptions at Etna, Stromboli, and Vulcano. Data are from Simkin and Siebert (1994) and from Boschi *et al.* (1997).

earthquake date	epicentral MCS intensity	epicentral area	subsequent eruptions
4 Feb. 1169	XI	Estern Sicily and western Calabria	a doubtful eruption from Etna on Feb. 1169
10 Dec. 1542	IX-X	Southeastern Sicily	none
11 Jan. 1693	XI	Southeastern Sicily	none
5 Mar. 1823	X	Northeastern Sicily	none
28 Dec. 1908	XI	Messina Straits	none
15 Oct. 1911	X	Southeastern flank of Mt Etna	none

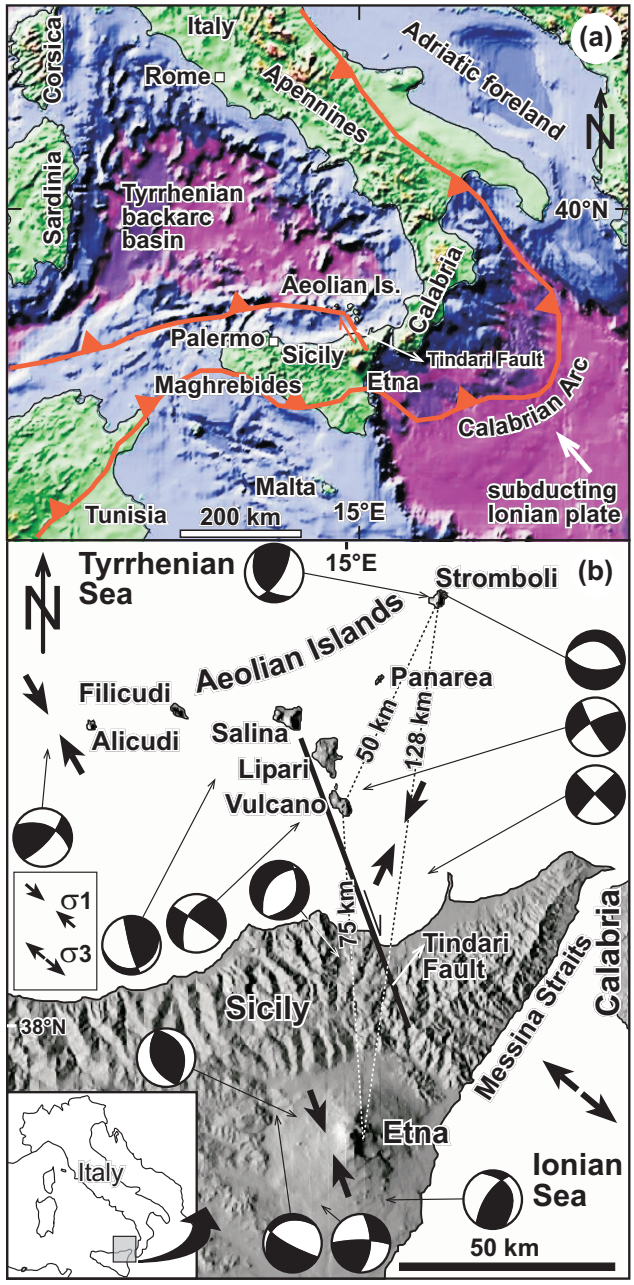

Fig. 1a,b. (a) Tectonic map of Southern Italy. Main fold-thrust belts occurring along the African-European plate boundary (*i.e.*, Apennines, Calabrian Arc, and Maghrebides) are drawn in red. (b) Hillshade of north-eastern Sicily, including the studied volcanoes (*i.e.*, Etna, Stromboli, and Vulcano). Note that Stromboli and Vulcano are included in the Aeolian Archipelago. Earthquake focal mechanisms (M ≥ 3.5) and arrows indicating active stresses are from Neri *et al.* (2005).

slab (African affinity) is subducting toward the northwest beneath the Calabrian Arc, whereas large slab windows occur beneath Sicily and the southern Apennines, where subduction is mostly inactive (Gvirtzman and Nur, 2001; Faccenna *et al*., 2004, 2005). The Apennine and Maghrebian thrust-fold belt have grown since late Paleogene time along the Africa-Eurasia suture zone, with eastward and southward vergence, respectively. To the north of Sicily, the oceanic Tyrrhenian backarc basin started to form since about late Neogene time (Malinverno and Ryan, 1986; Dewey *et al.*, 1989; Patacca *et al.*, 1992).

Seismic and geodetic evidence from Sicily and surrounding regions shows that, in the central Mediterranean region, Africa and Eurasia are converging at a considerable rate (circa 3 mm/yr) and that both the Etnean and Aeolian areas are undergoing N-S-oriented tectonic compression (fig. 1b; Barberi *et al*., 2000; Neri *et al*., 2003, 2005; D'Agostino and Selvaggi, 2004; Goes *et al*., 2004; Montone *et al*., 2004; Pondrelli *et al*., 2004). In the study area, main active tectonic elements are the roughly E-W-trending thrust belt in the southern Tyrrhenian area and the NNW-striking Tindari Fault between the Aeolian Islands and Mount Etna (fig. 1). The compressional belt in the southern Tyrrhenian area accommodates most of the Africa-Eurasia ongoing convergence in the central Mediterranean area and is characterized by compressional and transpressional earthquakes with a maximum recorded magnitude of 5.9 (Goes *et al.*, 2004; Billi *et al.*, 2007). This belt involves the western islands of the Aeolian Archipelago, *i.e*., Alicudi and Filicudi, which are the summit of submarine volcanoes inactive since about mid-Pleistocene time. The Tindari Fault is the eastern boundary of the south-Tyrrhenian compressional belt and is characterized by right-lateral strike-slip earthquakes with a maximum recorded magnitude of 5.5. This fault involves the central islands of the Aeolian Archipelago (Salina, Lipari, and Vulcano) and extends toward the south near Mount Etna (Ghisetti, 1979; Tortorici *et al.*, 1995; Ventura *et al*., 1999; Billi *et al.*, 2006).

The Aeolian volcanoes (Alicudi, Filicudi, Lipari, Panarea, Salina, Stromboli, and Vulcano, fig. 1) form a high-K calc-alkaline island arc, whose activity started about 1.3 Myr ago and is still active on at least three of the seven major islands, namely Lipari (last eruption in 729), Vulcano (last eruptions in 1888-1892), and Stromboli (Simkin and Siebert, 1994; Behncke, 2001). Hydrothermal activity offshore Panarea has occurred in historical times and in recent years (*e.g*., Gabbianelli *et al.*, 1993; Esposito *et al*., 2006). Stromboli is characterized by a persistent volcanic activity consisting in continuous small explosions occurring at approximately regular intervals of a few minutes (*i.e*., strombolian activity). However, individual events, such as lava effusions and paroxysmal eruptions, occurred at Stromboli during recent and historical times (Rittmann, 1931; Simkin and Siebert, 1994). The volcanic activity of Vulcano has been characterized by powerful and impressive explosions (*i.e*., vulcanian eruptions) alternated with less frequent effusive events (Frazzetta *et al.*, 1984; Simkin and Siebert, 1994).

Volcanism in the Etnean area started about 0.5 Myr ago with tholeiitic magmas (Branca *et al.*, 2008). The modern volcano formed by a succession of volcanic edifices consisting in alternating pyroclastic and effusive rocks (Gillot *et al.*, 1994; Behncke, 2001; Tanguy *et al.*, 2007; Branca *et al*., 2008). The volcanic activity of Etna is, in fact, mostly effusive; however, explosive activity has often occurred at the summit craters (*e.g*., Simkin and Siebert, 1994). Lateral effusive and mildly explosive eruptions have also been frequent at Mount Etna (Rittmann, 1964; Lanzafame *et al.*, 2003; Alparone *et al.*, 2005). The source of Etna magmatism is possibly connected with a mantle plume that Montelli *et al.* (2004) imaged above 1000 km using seismic tomography. Alternatively or complementarily, the voluminous melting under Mount Etna may result from suction of asthenospheric material induced by the backward migration of the descending Ionian slab (Gvirtzman and Nur, 1999).

3. Examples of concurrent eruptions

Eruption catalogues are notoriously subjective. Eruptive activity is gradational and activity during a given month may mean a variety of

different phenomena. To fill out this story, before the statistical analysis of the eruption catalogue, brief narratives of four of the most notable examples of concurrent activity are provided.

Two of these episodes fall outside our statistical study period (see the following section) and three involve observations from another Aeolian volcano (*i.e.*, Panarea), but these stories are anyhow included to provide examples of the type of phenomena expected.

The acronym VEI is henceforth used instead of volcanic explosivity index (Newhall and Self, 1982) and the related values are from Simkin and Siebert (1994).

3.1. *Concurrent activity during 2002-2003*

The 2002 eruption of Etna started the night between 26 and 27 October 2002 from the summit craters, concurrently with the formation of ground-surface fractures in this area. From the summit craters, fractures propagated toward the south and toward the northeast.

Newly generated vents and cones developed along these fractures.

For about two months since the onset of the eruption, voluminous emissions of ash occurred. Volcanic ashes fell in the nearby regions of Sicily and Calabria. After about 95 days of almost continuous eruption, on 29 January 2003, Etna ceased most of its effusive and explosive activity.

The 2002-2003 eruption of Etna was highly explosive, possibly one of the most explosive of the last 350 years.

Early in the morning of 3 November 2002, local fishermen observed spots of anomalous seawater boiling and high mortality of fishes offshore Panarea, and perceived smell of sulphurs. In particular, five major sites of gas emissions were found around the islets of Lisca Bianca, Bottaro, and Lisca Nera. At these sites, ascent of gas bubbles with diameter up to 1 m on the sea surface signalled the presence of submarine gas-emissions. With the exception of one site close to Lisca Bianca, these sites were previously unknown as gas-emitting spots. Gas emissions originated from NW- and NE-striking fractures in volcanic rocks lying at depths between 8 and 30 m from the sea surface. Gas emissions offshore Panarea gradually ceased during the first months of 2003.

On 28 December 2002, after 17 years of mild although continuous volcanic activity, an intense eruption began at Stromboli. The eruption was preceded by seismic swarms and by an increase in volcanic tremors since 3 November 2002, concurrently with the onset of gas emissions offshore Panarea.

Since 28 December 2002, lava flowed from the Stromboli summit crater into the sea along the steep northwest flank. Renewed lava flow occurred since 30 December 2002. The eruption mostly ceased by 5 April 2003, when a powerful explosion occurred at the summit crater of Stromboli.

The above information is mostly synthesized after Acocella *et al.* (2003); Dellino and Kyriakopoulos (2003); Patanè *et al.* (2003); Caliro *et al.* (2004); Calvari *et al.* (2005); Ripepe *et al.* (2005); Walter *et al.* (2005); Esposito *et al.* (2006), and Cigolini *et al.* (2007).

3.2. *Concurrent activity during 1886-1890*

From 10 January to 31 March 1886, strombolian activity occurred at Vulcano. On 22 January 1886, volcanic explosions occurred at Stromboli. On 18 May 1886, an eruption began at the summit craters of Mount Etna. This eruption was highly explosive (VEI = 3).

During January, March, and November 1887, volcanic explosions occurred at Stromboli. On 3 August 1888, an eruption began at Vulcano.

The eruptive activity of Vulcano ceased in March 1990. The 1888-1890 eruption of Vulcano was highly explosive (VEI = 3). On 23 October 1888, volcanic explosions and lava fountains occurred at Stromboli. On 29 November 1888, offshore Vulcano, local fishermen observed boiling seawater and associated fish mortality, and perceived smell of sulphurs.

The above information are mostly synthesized after Mercalli (1888); Silvestri (1890, 1893); Baratta (1901) and Simkin and Siebert (1994).

3.3. *Concurrent activity during 1865*

On 30 January 1865, an explosive (VEI≥2) eruption occurred at Etna. At the onset of the eruption, NE-striking fractures propagated across the summit crater of Mount Etna. Several vents and cones formed along these fractures. The effusive and explosive activity at Mount Etna lasted for about 90 days. Voluminous emissions of ash, which fell for about two months in the nearby regions of Sicily and Calabria, accompanied the eruption from the beginning. During the 1865 eruption of Etna, emissions of sulphurous gases occurred offshore Panarea. From 26 January to 2 February 1865, volcanic explosions occurred at Stromboli.

The above information is mostly synthesized after Fouqué (1865); Silvestri (1867); Mercalli (1879, 1888); Baratta (1901), and Simkin and Siebert (1994). Most volcanic phenomena occurred at Etna and Aeolian volcanoes during 1865 are incredibly very similar to those occurred at the same volcanoes during 2002-2003.

3.4. *Concurrent activity during 126 BC*

Paulus Orosius, a Latin historian lived in the 5th Century. In his Historiarum Adversus Paganos wrote: «Under the consulate of M. Aemilius Laepidus and L. Orestes, Mount Etna was violently shaken by a powerful tremble and poured out waves of fire globes. The day after, the Lipari Islands (*i.e*., also known as Aeolian Islands) and nearby the sea reached such a high boiling point that rocks were burnt and broken up. Ships, axes, and wax were carbonized and melted, dead fishes were burnt on the sea surface, and several men, except those who were able to escape, were stifled and their inner organs burnt by breathing». Strabo, a Greek geographer, and Julius Obsequens, a Latin historian, had reported the same event in documents dated back to the 1st Century BC (Geographia) and to the 4th Century (De Prodigiis), respectively. The events reported by the above-cited authors refer to the explosive eruption of Mount Etna started in June 126 BC and to the contemporaneous emissions of gas occurred in the offshore area between Vulcano and Panarea.

4. Statistical analysis of the eruption catalogue

This section analyses the historical frequency of simultaneous eruptions at two or three volcanoes among Etna, Stromboli, and Vulcano. The analysed catalogue is the one compiled by Simkin and Siebert (1994). We preferred to use the printed version of this catalogue (Simkin and Siebert, 1994) rather than the online version available at www.volcano.si.edu, because this latter is a non-static document updated in subsequent years (Siebert and Simkin, 2002), where, however, reasons for amendments are not explained, at least for what concerns the studied volcanoes. The problem of possible errors contained in the historical catalogue is addressed below in the discussion section.

As eruptions are often ongoing sequences of various and heterogeneous phenomena (see the preceding section), the problem studied here is simply whether or not eruptions at Etna, Stromboli, and Vulcano overlapped more often than expected by chance. This means that we do not consider eruption onset, whose exact dates are often lacking of poorly constrained (Simkin and Siebert, 1994). Instead, we analyse eruption durations, that is whether an eruption is in progress at some point in a specific time interval. To do so, simultaneous months and years including eruptions at two or three of the studied volcanoes are considered (tables III and IV). The analysis does not attempt to distinguish between eruptive styles or locations within a given volcanic system. This leaves the eruptive triggers poorly constrained, but makes the statistics possible for the historical data.

A null hypothesis can be constructed by using the observed record (tables III and IV) to calculate the expected probability of concurrent eruptions if the volcanoes do not interact. For instance, if the observed historical probability of Etna erupting in a given month or year (p_E) is the number of months or years including Etna's eruptions divided by the total number of months or years included in the studied period, and the observed historical probability of Stromboli (p_S) is computed in the same manner, then the expected historical probability (or ex-

pected probability) of concurrent eruptions at Etna and Stromboli $p_{E\text{-}S}$ is simply the product p_E p_S. In this section, the null hypothesis that eruptions at each of the volcanoes are statistically independent is evaluated by calculating the expected probability of concurrent eruptions (*e.g.*, p_E p_S) at two or three volcanoes among Etna, Stromboli, and Vulcano and by comparing it to the observed probability of concurrent eruptions.

Before evaluating the probabilities, the catalogue is limited by type of data and by time to provide uniform completeness over the study interval. The catalogue is expected to be complete for the largest, most easily observable eruptions, but progressively more incomplete at the smaller sizes. Volcanic eruptions generally follow a power law distribution in sizes with many more small eruptions than large ones as quantified by VEI. Significant depressions at small VEI relative to the trend at large VEI suggest that there are missing eruptions in the catalogue. Figure 2 suggests that the volcanic catalogue used for this region (Simkin and Siebert, 1994) is only complete for about VEI ≥ 2. For this reason, only eruptions with VEI ≥ 2 are used for the analysis.

To find the temporal intervals significant for the statistical analysis, the temporal distribution of data (*i.e.*, eruptions) for the studied volcanoes is analysed. The catalogue is significant, by number of data, since about the 18th Century (fig. 3). About 1700 or younger times are therefore considered as the lower temporal boundary for the following statistical analysis.

The limited catalogue is used to estimate the probability of eruption per month and per year of each individual volcano as above explained. Results are plotted in probability versus time diagrams (fig. 4) to check whether the statistical analysis is sensitive to the time window. In each diagram, observed and expected probabilities of concurrent eruptions at two volcanoes between Etna, Stromboli, and Vulcano are compared. Etna-Vulcano and Stromboli-Vulcano pairs of volcanoes generally erupt simultaneously more frequently than would be expected based on the individual rates (figs. 4b and 4c). This relationship is particularly evident for the Stromboli-Vulcano pair (fig. 4c). In contrast, the simultaneous eruptions of Etna and Stromboli are often less frequent than would be expected based on the individual rates (fig. 4a).

The expected and observed probabilities of occurrence of simultaneous eruptions at the three studied volcanoes are also considered. Within the 1700-1890 period, the expected probability of a triple eruption is 0.015% by using months as a time period, and 0.400% using years. Within the same period (*i.e.*, 1700-1890), the observed probability of a triple eruption is

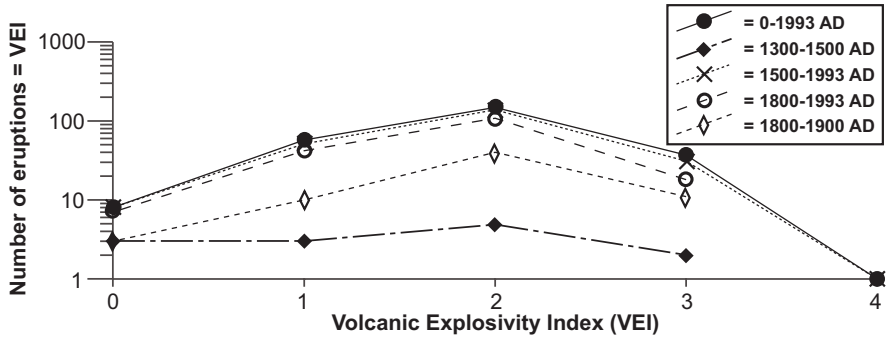

Fig. 2. Relationship between the number of eruptions and the «magnitude» of the eruption expressed by the volcanic explosivity index (VEI) for Etna, Stromboli, and Vulcano. Data (tables III and IV) are from Simkin and Siebert (1994).

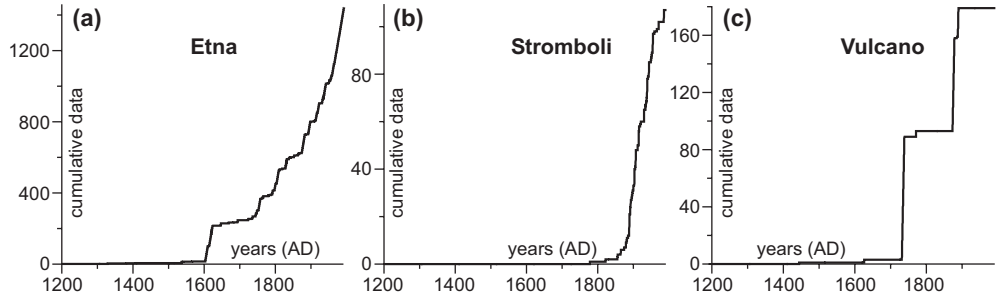

Fig. 3a-c. Relationships between the cumulative number of data (*i.e.*, months including eruptions with VEI ≥ 2) and time for (a) Etna, (b) Stromboli, and (c) Vulcano. Data (table III) are from Simkin and Siebert (1994).

Table II. Time order of erupting volcanoes in the occasion of duple and triple concurrent eruptions between 1700 and 1993. Data are from Simkin and Siebert (1994).

type of concurrent eruptions	erupting volcanoes	no. of times in which the volcano erupted before the others in theoccasion of concurrent eruptions		
		Etna	Stromboli	Vulcano
duple	Etna-Stromboli	23	3	/
duple	Etna-Vulcano	0	/	4
duple	Stromboli-Vulcano	/	0	2
triple	Etna-Stromboli-Vulcano	0	0	1

0.044% by using months as time period, and 1.047% by using years (tables III and IV). It follows that, in both cases, the observed probability is almost three times the expected probability.

It is eventually analysed whether concurrent eruptions often occur in a particular order. During the 1700-1993 period, the order of eruption is often Vulcano, Etna, and then Stromboli (tables II and III). If only two of the three erupt, the order is usually preserved.

5. Statistical analysis of the earthquake catalogue

To infer possible chronological correlations between the seismic energies released in the Etnean and Aeolian areas, the related monthly totals of seismic moment (TM_0) are computed and compared.

The problem studied in this section is simply whether or not the greatest TM_0-values for the Aeolian and Etnean areas overlapped more often than expected by chance. To do so, the magnitude of earthquakes (*i.e.*, only those less than 30 km deep) occurred in the Aeolian and Etnean areas during the January 1983-December 2007 period (*i.e.*, 300 months) is extracted from the INGV catalogue of earthquakes available on-line at www.ingv.it (Bollettino Sismico Italiano, Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy). Date and geographic location of earthquakes (*i.e.*, Aeolian and Etnean areas) are included in the catalogue. The

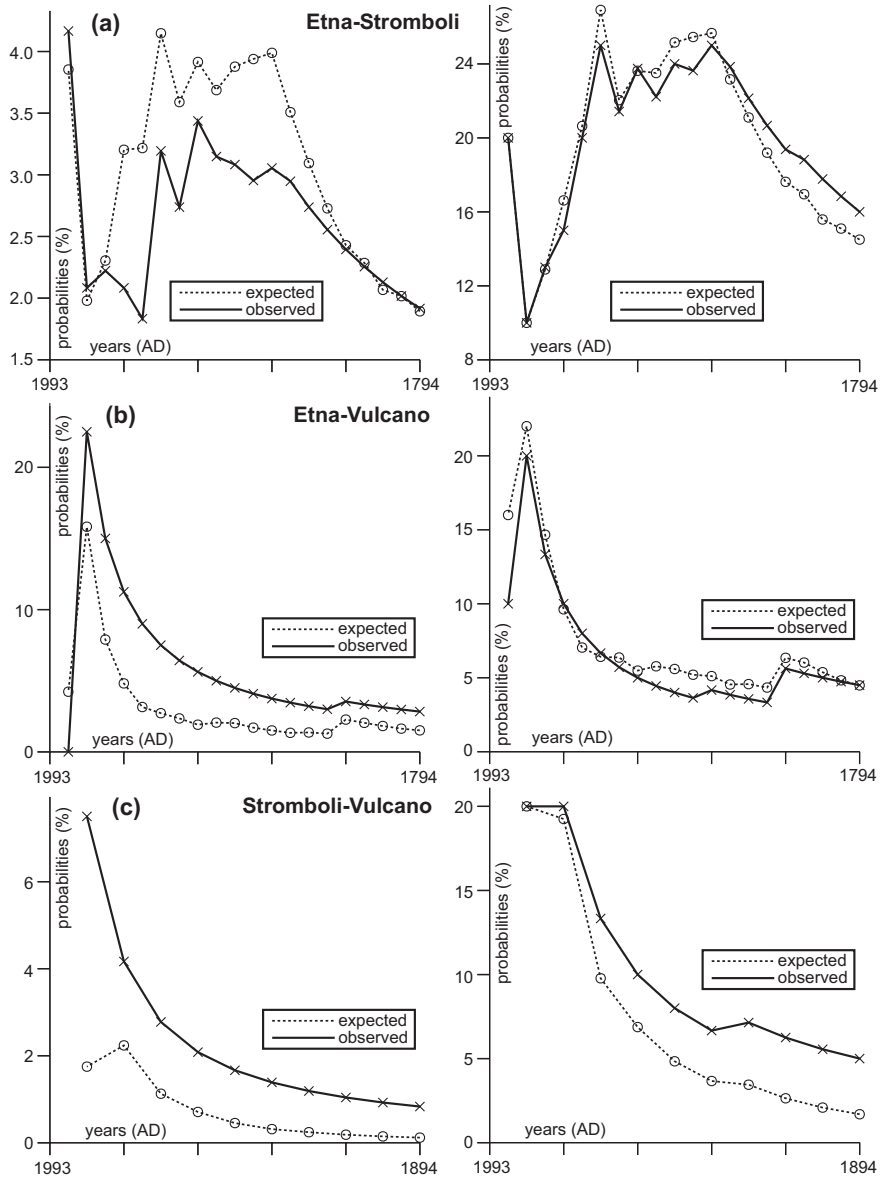

Fig. 4a-c. Expected and observed probabilities of occurrence of months (diagrams to the left) and years (diagrams to the right) including concurrent eruptions at (a) Etna and Stromboli, (b) Etna and Vulcano, and (c) Stromboli and Vulcano, versus time. Data (tables III and IV) are from Simkin and Siebert (1994). A rather high correlation of activity is observed in (b) and (c).

magnitude of earthquakes is converted into the seismic moment by applying the equation $M = 2/3 \log M_0 - 10.7$, where M is the magnitude and M_0 is the seismic moment (Hanks and Kanamori, 1979). TM_0-values are then computed (table V).

By following the same probabilistic approach used above for concurrent eruptions, the expected and observed probabilities that the greatest TM_0 of the Aeolian and Etnean areas are contemporary are computed and compared (fig. 5). Figure 5 shows that, except for the two months with the greatest TM_0-values (*i.e.*, for no. of months ≥ 2 in fig. 5), the observed probability is always significantly greater than the expected probability.

From the eruption catalogues of Simkin and Siebert (1994) and Siebert and Simkin (2002), it is inferred that, both for the Aeolian and Etnean areas, the greatest TM_0-values are, in some cases, contemporary with or near to significant eruptions (*e.g.*, October 1986, July 2001, October, 2002, and December, 2006 at Etna; November, 1994 and July. 2001 at Stromboli), whereas in some other cases there is no correlation with eruptions (*e.g.*, December, 1997 and January, 1998 for Etna; October, 1986, July-August, 1995, and April, 2002 for Stromboli).

6. Discussion

The statistical analysis of the eruption catalogue shows that, during 1700-1993, concurrent eruptions at the studied volcanoes occurred, at least in some cases, at a frequency higher than expected based solely on random probability (fig. 4). This result, in particular, applies to the Stromboli-Vulcano and Etna-Vulcano pairs. It follows that concurrent eruptions at these volcanoes can be plausibly interpreted as non-accidental. The considered temporal interval is, however, limited and the statistical analyses may therefore be poorly representative of the real rate of concurrent eruptions. Moreover, statistical results may reflect reporting biases and the analysed catalogues may contain errors. These issues make our results preliminary and our hypotheses very speculative at least in some instances. On the other hand, statistical analyses do not consider eruptions with VEI < 2 and a series of volcanic phenomena such as degassing, unrest, or hydrothermalism, which are poorly reported in the catalogues but can be the manifestation of linked activities at Etna and Aeolian volcanoes (*e.g.*, Cigolini *et al.*, 2007). It follows that the incidence of concurrent volcanic phenomena at the studied volcanoes may be greater than that obtained by the statistical analyses presented in this paper.

The recent literature on eruption triggering suggests that the cause of concurrent eruptions may be a reciprocal stimulus or an external common one. Among the possible external causes, earthquakes are considered the most common and viable ones (*e.g.*, Linde and Sacks, 1998; Manga and Brodsky, 2006). Earthquakes may trigger volcanic eruptions by dynamic stress (*i.e.*, the shaking of rocks at the passage of seismic waves; *e.g.*, Walter and Amelung, 2007). In addition to dynamic stress, fault slip induces a static stress change (*i.e.*, the fault slip induces a permanent deformation in the nearby crust), which can be at the origin of volcanic eruptions (*e.g.*, Bautista *et al.*, 1996; Nostro *et al.*, 1998). In the first case (*i.e.*, dynamic stress), the earthquake and the volcano can even be very far (*e.g.*, Manga and Brodsky, 2006). In contrast, the effect of the fault-related static stress change decays rapidly with the distance and, therefore, the fault has to be near the volcano to efficiently excite it.

In addition to earthquakes and fault slip, the stress changes induced by the annual sea-level variations (McNutt and Beavan, 1987), by the Earth and ocean daily tides (Glasby and Kasahara, 2001), the glacial loading (Tryggvasson, 1973), by the seasonal atmospheric variations (Ohtake and Nakahara, 1999), and by the regional tectonics (Mulargia *et al.*, 1991; McNutt, 1999; Madonia *et al.*, 2008) have been hypothesized as potential external triggers of volcanic eruptions.

Alternatively or complementarily, eruptions can reciprocally trigger other events. Either the static stress generated by the movement of magma (Miklius and Cervelli, 2003; Gudmundsson and Andrew, 2007) or the shaking generated by explosive eruptions and associat-

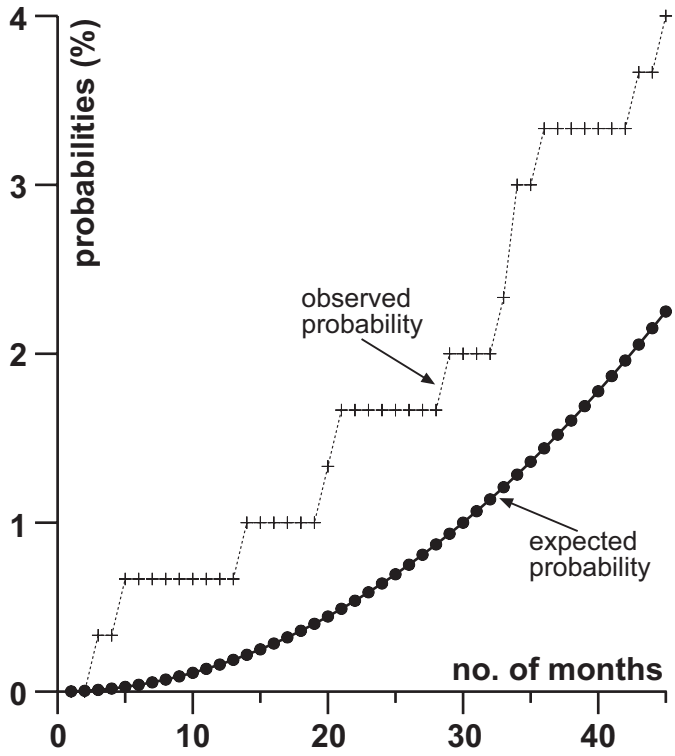

Fig. 5. Expected and observed probabilities of concurrence of months with the greatest monthly totals of seismic moment (TM_0) for the Aeolian and Etnean areas (table V). For a number of months greater than 45, the divergence between the expected and observed probabilities increases.

ed earthquakes (Kanamori and Givens, 1982) can trigger adjacent volcanoes.

Eventually, concurrent eruptions from adjacent volcanoes can be triggered by a simultaneous increase of magma supply from the mantle (Miklius and Cervelli, 2003).

The presented statistical and anecdotal evidence of concurrent activities at Etna, Stromboli, and Vulcano does not allow an unequivocal identification of a plausible triggering mechanism. It cannot even be discounted the idea that the triggering mechanism may have changed from time to time or may have been a combination of the above-quoted triggering mechanisms. Some simple inferences can, however, be drawn from the presented evidence. The sequential order of eruptions (table II) suggests that eruption-eruption reciprocal triggering may have been important. As Vulcano was often the most explosive of the volcanoes (Simkin and Siebert, 1994; tables III and IV), it likely generated the strongest seismic waves and hence usually began the sequence (table II). The vicinity of Vulcano to both Etna and Stromboli (fig. 1) may explain why its relationships with these volcanoes are seemingly causal (figs. 4b and 4c), whereas concurrent activities at Etna and Stromboli, which are as far as about 130 km, seem accidental or less connected (fig. 4a). The presence of an active fault zone between Vulcano and Etna (*i.e.*, the Tindari Fault, fig. 1) may have enhanced the directivity of seismic waves between these volcanoes, thus promoting the dynamic stress transfer. Of

course, whether or not a given dynamic input successfully triggers an eruption depends on the state of the volcano, particularly its magma chamber. Accordingly, it is not expected to observe perfect correlations or a deterministic sequence of eruptions.

A reciprocal triggering similar to that proposed for Iceland volcanoes (*i.e*., by direct mechanical interactions among volcanoes about 30 km distant; Gudmundsson and Andrew, 2007) seems less likely for the studied volcanoes, whose reciprocal distance is as small as 50 km (fig. 1). However, as shown by the reported anecdotal instances, the concurrent volcanic phenomena can be very heterogeneous and can involve other volcanoes in addition to Etna, Stromboli, and Vulcano. For instance, increased degassing from Panarea, which is only about 22 km from Stromboli and 30 km from Vulcano, may have been the consequence of direct mechanical interactions with the adjacent active volcanoes (*e.g*., Gudmundsson and Andrew, 2007).

Concerning external triggers, it is historically demonstrated that the studied volcanoes did not respond immediately or shortly to dynamic stresses generated by large nearby earthquakes (table I). Moreover, there is no evidence – anecdotal or otherwise – that either local or remote large earthquakes triggered eruptions in the region (see the NEIC Catalogue available on-line at neic.usgs.gov/neis/epic/ and the INGV Catalogue available on-line at www.ingv.it); however, also the hypothesis of a stimulus by external earthquakes cannot be fully discounted. For instance, the eruptive cycle of 2002-2003 involving eruptions at Etna and Stromboli and degassing phenomena at Panarea started about one month after the 6 September 2002, M 5.6, Palermo (fig. 1) earthquake. This sequence of seismic and volcanic phenomena has been interpreted as causal by Cigolini *et al*. (2007).

Alternatively, the concurrent eruptions at the Southern Italian volcanoes may have been the effect of the regional tectonic compression (fig. 1b; Goes *et al.*, 2004; Neri *et al.*, 2005). Such a stress may have been periodically relieved by a large earthquake on one segment of the regional fault network (Boschi *et al.*, 1997; Neri *et al*., 2006) or, more often, by swarms of eruptions and moderate-to-small magnitude earthquakes where the triggering threshold is low (*i.e*., in the active volcanic districts) (*e.g*., Brodsky *et al*., 2000). The statistical analysis of earthquakes instrumentally-recorded between 1983 and 2007 (fig. 5) supports this hypothesis although, of course, coupled seismicity in the Etnean and Aeolian areas may alternatively be explained as the consequence of coupled volcanism triggered by some other cause such as a simultaneous increase of magma supply to Etna and the Aeolian volcanoes. A link between the regional tectonics and the volcanic activity of Etna was previously proposed by Mulargia *et al*. (1991). Moreover, Feuillet *et al*. (2006) demonstrated that the largest nearby earthquakes occurred after years-long-periods of volcanic activity of Etna, this evidence possibly indicating a period of tectonic load that first triggered the volcanic activity and, eventually, a large earthquake.

7. Conclusions

Analyses of eruption and earthquake catalogues show that causal links between concurrent eruptions at two or three volcanoes among Etna, Stromboli, and Vulcano are plausible, particularly in the Stromboli-Vulcano and Etna-Vulcano cases. These links are also supported by recent and historical anecdotal instances. Limits of statistical results, however, compel further research to better constrain the temporal pattern of such phenomena and to identify their causes. We look forward to our predictions of a moderate incidence of concurrent eruptions being confirmed or refuted with the passage of time and with more sophisticated analyses of new events (*e.g*., Jaquet and Carniel, 2006).

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Table III. Eruption (with VEI ≥ 2) occurrences by month between 0 and 1993 AD at Etna, Stromboli, and Vulcano.
VEI = Volcanic Explosivity Index; 0 = no occurrence; 1 = occurrence. Data are from Simkin and Siebert (1994).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
252	2	1	3	0		0
1329	6	1	2	0		0
1329	7	1	3	0		0
1329	8	1	3	0		0
1381	8	1	2	0		0
1408	11	1	3	0		0
1444	2	0		0		1
1536	3	1	3	0		0
1536	4	1	3	0		0
1537	3	1	2	0		0
1537	4	1	2	0		0
1537	5	1	2	0		0
1537	6	1	2	0		0
1537	7	1	2	0		0
1541	7	1	2	0		0
1566	11	1	2	0		0
1603	7	1	2	0		0
1603	8	1	2	0		0
1603	9	1	2	0		0
1603	10	1	2	0		0
1603	11	1	2	0		0
1603	12	1	2	0		0
1604	1	1	2	0		0
1604	2	1	2	0		0
1604	3	1	2	0		0
1604	4	1	2	0		0
1604	5	1	2	0		0
1604	6	1	2	0		0
1604	7	1	2	0		0
1604	8	1	2	0		0
1604	9	1	2	0		0
1604	10	1	2	0		0
1604	11	1	2	0		0
1604	12	1	2	0		0
1605	1	1	2	0		0
1605	2	1	2	0		0
1605	3	1	2	0		0
1605	4	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1605	5	1	2	0		0
1605	6	1	2	0		0
1605	7	1	2	0		0
1605	8	1	2	0		0
1605	9	1	2	0		0
1605	10	1	2	0		0
1605	11	1	2	0		0
1605	12	1	2	0		0
1606	1	1	2	0		0
1606	2	1	2	0		0
1606	3	1	2	0		0
1606	4	1	2	0		0
1606	5	1	2	0		0
1606	6	1	2	0		0
1606	7	1	2	0		0
1606	8	1	2	0		0
1606	9	1	2	0		0
1606	10	1	2	0		0
1606	11	1	2	0		0
1606	12	1	2	0		0
1607	1	1	2	0		0
1607	2	1	2	0		0
1607	3	1	2	0		0
1607	4	1	2	0		0
1607	5	1	2	0		0
1607	6	1	2	0		0
1607	7	1	2	0		0
1607	8	1	2	0		0
1607	9	1	2	0		0
1607	10	1	2	0		0
1607	11	1	2	0		0
1607	12	1	2	0		0
1608	1	1	2	0		0
1608	2	1	2	0		0
1608	3	1	2	0		0
1608	4	1	2	0		0
1608	5	1	2	0		0
1608	6	1	2	0		0
1608	7	1	2	0		0
1608	8	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1608	9	1	2	0		0
1608	10	1	2	0		0
1608	11	1	2	0		0
1608	12	1	2	0		0
1609	1	1	2	0		0
1609	2	1	2	0		0
1609	3	1	2	0		0
1609	4	1	2	0		0
1609	5	1	2	0		0
1609	6	1	2	0		0
1609	7	1	2	0		0
1609	8	1	2	0		0
1609	9	1	2	0		0
1609	10	1	2	0		0
1609	11	1	2	0		0
1609	12	1	2	0		0
1610	1	1	2	0		0
1610	2	1	2	0		0
1610	3	1	2	0		0
1610	4	1	2	0		0
1610	5	1	2	0		0
1610	6	1	2	0		0
1610	7	1	2	0		0
1610	8	1	2	0		0
1614	7	1	2	0		0
1614	8	1	2	0		0
1614	9	1	2	0		0
1614	10	1	2	0		0
1614	11	1	2	0		0
1614	12	1	2	0		0
1615	1	1	2	0		0
1615	2	1	2	0		0
1615	3	1	2	0		0
1615	4	1	2	0		0
1615	5	1	2	0		0
1615	6	1	2	0		0
1615	7	1	2	0		0
1615	8	1	2	0		0
1615	9	1	2	0		0
1615	10	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1615	11	1	2	0		0
1615	12	1	2	0		0
1616	1	1	2	0		0
1616	2	1	2	0		0
1616	3	1	2	0		0
1616	4	1	2	0		0
1616	5	1	2	0		0
1616	6	1	2	0		0
1616	7	1	2	0		0
1616	8	1	2	0		0
1616	9	1	2	0		0
1616	10	1	2	0		0
1616	11	1	2	0		0
1616	12	1	2	0		0
1617	1	1	2	0		0
1617	2	1	2	0		0
1617	3	1	2	0		0
1617	4	1	2	0		0
1617	5	1	2	0		0
1617	6	1	2	0		0
1617	7	1	2	0		0
1617	8	1	2	0		0
1617	9	1	2	0		0
1617	10	1	2	0		0
1617	11	1	2	0		0
1617	12	1	2	0		0
1618	1	1	2	0		0
1618	2	1	2	0		0
1618	3	1	2	0		0
1618	4	1	2	0		0
1618	5	1	2	0		0
1618	6	1	2	0		0
1618	7	1	2	0		0
1618	8	1	2	0		0
1618	9	1	2	0		0
1618	10	1	2	0		0
1618	11	1	2	0		0
1618	12	1	2	0		0
1619	1	1	2	0		0
1619	2	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1619	3	1	2	0		0
1619	4	1	2	0		0
1619	5	1	2	0		0
1619	6	1	2	0		0
1619	7	1	2	0		0
1619	8	1	2	0		0
1619	9	1	2	0		0
1619	10	1	2	0		0
1619	11	1	2	0		0
1619	12	1	2	0		0
1620	1	1	2	0		0
1620	2	1	2	0		0
1620	3	1	2	0		0
1620	4	1	2	0		0
1620	5	1	2	0		0
1620	6	1	2	0		0
1620	7	1	2	0		0
1620	8	1	2	0		0
1620	9	1	2	0		0
1620	10	1	2	0		0
1620	11	1	2	0		0
1620	12	1	2	0		0
1621	1	1	2	0		0
1621	2	1	2	0		0
1621	3	1	2	0		0
1621	4	1	2	0		0
1621	5	1	2	0		0
1621	6	1	2	0		0
1621	7	1	2	0		0
1621	8	1	2	0		0
1621	9	1	2	0		0
1621	10	1	2	0		0
1621	11	1	2	0		0
1621	12	1	2	0		0
1622	1	1	2	0		0
1622	2	1	2	0		0
1622	3	1	2	0		0
1622	4	1	2	0		0
1622	5	1	2	0		0
1622	6	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1622	7	1	2	0		0
1622	8	1	2	0		0
1622	9	1	2	0		0
1622	10	1	2	0		0
1622	11	1	2	0		0
1622	12	1	2	0		0
1623	1	1	2	0		0
1623	2	1	2	0		0
1623	3	1	2	0		0
1623	4	1	2	0		0
1623	5	1	2	0		0
1623	6	1	2	0		0
1623	7	1	2	0		0
1623	8	1	2	0		0
1623	9	1	2	0		0
1623	10	1	2	0		0
1623	11	1	2	0		0
1623	12	1	2	0		0
1624	1	1	2	0		0
1626	3	0		0		1
1626	4	0		0		1
1646	11	1	2	0		0
1646	12	1	2	0		0
1647	1	1	2	0		0
1647	2	1	2	0		0
1647	3	1	2	0		0
1647	4	1	2	0		0
1647	5	1	2	0		0
1647	6	1	2	0		0
1647	7	1	2	0		0
1647	8	1	2	0		0
1647	9	1	2	0		0
1647	10	1	2	0		0
1647	11	1	2	0		0
1669	3	1	3	0		0
1669	4	1	3	0		0
1669	5	1	3	0		0
1669	6	1	3	0		0
1669	7	1	3	0		0
1682	9	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1693	12	1	3	0		0
1694	1	1	3	0		0
1694	2	1	3	0		0
1694	3	1	3	0		0
1694	4	1	3	0		0
1694	5	1	3	0		0
1694	6	1	3	0		0
1694	7	1	3	0		0
1694	8	1	3	0		0
1694	9	1	3	0		0
1694	10	1	3	0		0
1694	11	1	3	0		0
1723	11	1	2	0		0
1723	12	1	2	0		0
1724	1	1	2	0		0
1724	2	1	2	0		0
1724	3	1	2	0		0
1724	4	1	2	0		0
1724	5	1	2	0		0
1731	12	0		0		1
1732	1	0		0		1
1732	2	0		0		1
1732	3	0		0		1
1732	4	0		0		1
1732	5	0		0		1
1732	6	0		0		1
1732	7	0		0		1
1732	8	0		0		1
1732	9	0		0		1
1732	10	0		0		1
1732	11	0		0		1
1732	12	1	2	0		1
1733	1	1	2	0		1
1733	2	0		0		1
1733	3	0		0		1
1733	4	0		0		1
1733	5	0		0		1
1733	6	0		0		1
1733	7	0		0		1
1733	8	0		0		1

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1733	9	0		0		1
1733	10	0		0		1
1733	11	0		0		1
1733	12	0		0		1
1734	1	0		0		1
1734	2	0		0		1
1734	3	0		0		1
1734	4	0		0		1
1734	5	0		0		1
1734	6	0		0		1
1734	7	0		0		1
1734	8	0		0		1
1734	9	0		0		1
1734	10	0		0		1
1734	11	0		0		1
1734	12	0		0		1
1735	1	0		0		1
1735	2	0		0		1
1735	3	0		0		1
1735	4	0		0		1
1735	5	0		0		1
1735	6	0		0		1
1735	7	0		0		1
1735	8	0		0		1
1735	9	0		0		1
1735	10	1	2	0		1
1735	11	1	2	0		1
1735	12	1	2	0		1
1736	1	1	2	0		1
1736	2	1	2	0		1
1736	3	1	2	0		1
1736	4	1	2	0		1
1736	5	1	2	0		1
1736	6	1	2	0		1
1736	7	1	2	0		1
1736	8	1	2	0		1
1736	9	1	2	0		1
1736	10	0		0		1
1736	11	0		0		1
1736	12	0		0		1

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1737	1	0		0		1
1737	2	0		0		1
1737	3	0		0		1
1737	4	0		0		1
1737	5	0		0		1
1737	6	0		0		1
1737	7	0		0		1
1737	8	0		0		1
1737	9	0		0		1
1737	10	0		0		1
1737	11	0		0		1
1737	12	0		0		1
1738	1	0		0		1
1738	2	0		0		1
1738	3	0		0		1
1738	4	0		0		1
1738	5	0		0		1
1738	6	0		0		1
1738	7	0		0		1
1738	8	0		0		1
1738	9	0		0		1
1738	10	0		0		1
1738	11	0		0		1
1738	12	0		0		1
1739	1	0		0		1
1744	7	1	2	0		0
1744	8	1	2	0		0
1744	9	1	2	0		0
1744	10	1	2	0		0
1744	11	1	2	0		0
1744	12	1	2	0		0
1745	1	1	2	0		0
1745	2	1	2	0		0
1745	3	1	2	0		0
1745	4	1	2	0		0
1745	5	1	2	0		0
1745	6	1	2	0		0
1745	7	1	2	0		0
1745	8	1	2	0		0
1745	9	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1747	9	1	2	0		0
1747	10	1	2	0		0
1747	11	1	2	0		0
1747	12	1	2	0		0
1748	1	1	2	0		0
1748	2	1	2	0		0
1748	3	1	2	0		0
1748	4	1	2	0		0
1748	5	1	2	0		0
1748	6	1	2	0		0
1748	7	1	2	0		0
1748	8	1	2	0		0
1748	9	1	2	0		0
1748	10	1	2	0		0
1748	11	1	2	0		0
1748	12	1	2	0		0
1749	1	1	2	0		0
1749	2	1	2	0		0
1749	3	1	2	0		0
1752	12	1	2	0		0
1753	1	1	2	0		0
1753	2	1	2	0		0
1753	3	1	2	0		0
1753	4	1	2	0		0
1753	5	1	2	0		0
1753	6	1	2	0		0
1753	7	1	2	0		0
1753	8	1	2	0		0
1753	9	1	2	0		0
1753	10	1	2	0		0
1753	11	1	2	0		0
1753	12	1	2	0		0
1754	1	1	2	0		0
1754	2	1	2	0		0
1754	3	1	2	0		0
1754	4	1	2	0		0
1754	5	1	2	0		0
1754	6	1	2	0		0
1754	7	1	2	0		0
1754	8	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1754	9	1	2	0		0
1754	10	1	2	0		0
1754	11	1	2	0		0
1754	12	1	2	0		0
1755	1	1	2	0		0
1755	2	1	2	0		0
1755	3	1	2	0		0
1755	4	1	2	0		0
1755	5	1	2	0		0
1755	6	1	2	0		0
1755	7	1	2	0		0
1755	8	1	2	0		0
1755	9	1	2	0		0
1755	10	1	2	0		0
1755	11	1	2	0		0
1755	12	1	2	0		0
1756	1	1	2	0		0
1756	2	1	2	0		0
1756	3	1	2	0		0
1756	4	1	2	0		0
1756	5	1	2	0		0
1756	6	1	2	0		0
1756	7	1	2	0		0
1756	8	1	2	0		0
1756	9	1	2	0		0
1756	10	1	2	0		0
1756	11	1	2	0		0
1756	12	1	2	0		0
1757	1	1	2	0		0
1757	2	1	2	0		0
1757	3	1	2	0		0
1757	4	1	2	0		0
1757	5	1	2	0		0
1757	6	1	2	0		0
1757	7	1	2	0		0
1757	8	1	2	0		0
1757	9	1	2	0		0
1757	10	1	2	0		0
1757	11	1	2	0		0
1757	12	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1758	1	1	2	0		0
1758	11	1	2	0		0
1758	12	1	2	0		0
1759	1	1	2	0		0
1759	2	1	2	0		0
1763	2	1	2	0		0
1763	3	1	2	0		0
1763	6	1	3	0		0
1763	7	1	3	0		0
1763	8	1	3	0		0
1763	9	1	3	0		0
1766	4	1	2	0		0
1766	5	1	2	0		0
1766	6	1	2	0		0
1766	7	1	2	0		0
1766	8	1	2	0		0
1766	9	1	2	0		0
1766	10	1	2	0		0
1766	11	1	2	0		0
1771	2	0		0		1
1771	3	0		0		1
1771	4	0		0		1
1771	5	0		0		1
1778	3	0		1	2	0
1780	4	1	2	0		0
1780	5	1	2	0		0
1780	6	1	2	0		0
1781	3	1	2	0		0
1781	4	1	2	0		0
1781	5	1	2	0		0
1787	6	1	4	0		0
1787	7	1	4	0		0
1787	8	1	4	0		0
1791	2	1	2	0		0
1791	3	1	2	0		0
1791	4	1	2	0		0
1791	5	1	2	0		0
1791	6	1	2	0		0
1791	7	1	2	0		0
1791	8	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1791	9	1	2	0		0
1792	3	1	2	0		0
1792	4	1	2	0		0
1792	5	1	3	0		0
1792	6	1	3	0		0
1792	7	1	3	0		0
1792	8	1	3	0		0
1792	9	1	3	0		0
1792	10	1	3	0		0
1792	11	1	3	0		0
1792	12	1	3	0		0
1793	1	1	3	0		0
1793	2	1	3	0		0
1793	3	1	3	0		0
1793	4	1	3	0		0
1793	5	1	3	0		0
1797	12	1	2	0		0
1798	1	1	2	0		0
1798	2	1	2	0		0
1798	3	1	2	0		0
1798	4	1	2	0		0
1798	5	1	2	0		0
1798	6	1	2	0		0
1798	7	1	2	0		0
1798	8	1	2	0		0
1798	9	1	2	0		0
1798	10	1	2	0		0
1798	11	1	2	0		0
1798	12	1	2	0		0
1799	1	1	2	0		0
1799	2	1	2	0		0
1799	3	1	2	0		0
1799	4	1	2	0		0
1799	5	1	2	0		0
1799	6	1	2	0		0
1799	7	1	2	0		0
1799	8	1	2	0		0
1799	9	1	2	0		0
1799	10	1	2	0		0
1799	11	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1799	12	1	2	0		0
1800	1	1	2	0		0
1800	2	1	2	0		0
1800	3	1	2	0		0
1800	4	1	2	0		0
1800	5	1	2	0		0
1800	6	1	2	0		0
1800	7	1	2	0		0
1800	8	1	2	0		0
1800	9	1	2	0		0
1800	10	1	2	0		0
1800	11	1	2	0		0
1800	12	1	2	0		0
1801	1	1	2	0		0
1802	11	1	2	0		0
1803	12	1	2	0		0
1804	1	1	2	0		0
1804	2	1	2	0		0
1804	3	1	2	0		0
1804	4	1	2	0		0
1804	5	1	2	0		0
1804	6	1	2	0		0
1804	7	1	2	0		0
1804	8	1	2	0		0
1804	9	1	2	0		0
1804	10	1	2	0		0
1804	11	1	2	0		0
1804	12	1	2	0		0
1805	1	1	2	0		0
1805	2	1	2	0		0
1805	3	1	2	0		0
1805	4	1	2	0		0
1805	5	1	2	0		0
1805	6	1	2	0		0
1805	7	1	2	0		0
1805	8	1	2	0		0
1805	9	1	2	0		0
1805	10	1	2	0		0
1805	11	1	2	0		0
1805	12	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1806	1	1	2	0		0
1806	2	1	2	0		0
1806	3	1	2	0		0
1806	4	1	2	0		0
1806	5	1	2	0		0
1806	6	1	2	0		0
1806	7	1	2	0		0
1806	8	1	2	0		0
1806	9	1	2	0		0
1806	10	1	2	0		0
1806	11	1	2	0		0
1806	12	1	2	0		0
1807	1	1	2	0		0
1807	2	1	2	0		0
1807	3	1	2	0		0
1807	4	1	2	0		0
1807	5	1	2	0		0
1807	6	1	2	0		0
1807	7	1	2	0		0
1807	8	1	2	0		0
1807	9	1	2	0		0
1807	10	1	2	0		0
1807	11	1	2	0		0
1807	12	1	2	0		0
1808	1	1	2	0		0
1808	2	1	2	0		0
1808	3	1	2	0		0
1808	4	1	2	0		0
1808	5	1	2	0		0
1808	6	1	2	0		0
1808	7	1	2	0		0
1808	8	1	2	0		0
1808	9	1	2	0		0
1808	10	1	2	0		0
1808	11	1	2	0		0
1808	12	1	2	0		0
1809	1	1	2	0		0
1809	2	1	2	0		0
1809	3	1	2	0		0
1809	4	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1809	5	1	2	0		0
1809	6	1	2	0		0
1809	7	1	2	0		0
1809	8	1	2	0		0
1809	9	1	2	0		0
1809	10	1	2	0		0
1809	11	1	2	0		0
1811	10	1	2	0		0
1811	11	1	2	0		0
1811	12	1	2	0		0
1812	1	1	2	0		0
1812	2	1	2	0		0
1812	3	1	2	0		0
1812	4	1	2	0		0
1812	5	1	2	0		0
1819	5	1	3	0		0
1819	6	1	3	0		0
1819	7	1	3	0		0
1819	8	1	3	0		0
1822	10	0		1	3	0
1828	8	1	2	0		0
1828	9	1	2	0		0
1828	10	1	2	0		0
1828	11	1	2	0		0
1828	12	1	2	0		0
1829	1	1	2	0		0
1829	2	1	2	0		0
1829	3	1	2	0		0
1829	4	1	2	0		0
1829	5	1	2	0		0
1829	6	1	2	0		0
1829	7	1	2	0		0
1829	8	1	2	0		0
1829	9	1	2	0		0
1829	10	1	2	0		0
1829	11	1	2	0		0
1829	12	1	2	0		0
1830	1	1	2	0		0
1830	2	1	2	0		0
1830	3	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1830	4	1	2	0		0
1830	5	1	2	0		0
1830	6	1	2	0		0
1830	7	1	2	0		0
1830	8	1	2	0		0
1830	9	1	2	0		0
1830	10	1	2	0		0
1830	11	1	2	0		0
1830	12	1	2	0		0
1831	1	1	2	0		0
1831	2	1	2	0		0
1831	3	1	2	0		0
1831	4	1	2	0		0
1831	5	1	2	0		0
1831	6	1	2	0		0
1831	7	1	2	0		0
1831	8	1	2	0		0
1831	9	1	2	0		0
1831	10	1	2	0		0
1831	11	1	2	0		0
1831	12	1	2	0		0
1832	1	1	2	0		0
1832	2	1	2	0		0
1832	3	1	2	0		0
1832	4	1	2	0		0
1832	5	1	2	0		0
1832	6	1	2	0		0
1832	7	1	2	0		0
1832	8	1	2	0		0
1832	9	1	2	0		0
1832	10	1	2	0		0
1832	11	1	2	0		0
1833	3	1	2	0		0
1838	7	1	2	0		0
1838	8	1	2	0		0
1838	9	1	2	0		0
1838	10	1	2	0		0
1838	11	1	2	0		0
1838	12	1	2	0		0
1839	1	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1839	2	1	2	0		0
1842	11	1	2	0		0
1842	12	1	2	0		0
1843	11	1	2	0		0
1852	8	1	2	0		0
1852	9	1	2	0		0
1852	10	1	2	0		0
1852	11	1	2	0		0
1852	12	1	2	0		0
1853	1	1	2	0		0
1853	2	1	2	0		0
1853	3	1	2	0		0
1853	4	1	2	0		0
1853	5	1	2	0		0
1855	10	0		1	2	0
1856	7	0		1	2	0
1863	5	1	2	0		0
1863	6	1	2	0		0
1863	7	1	2	0		0
1864	8	1	2	0		0
1864	9	1	2	0		0
1865	1	1	2	1	2	0
1865	2	1	2	1	2	0
1865	3	1	2	0		0
1865	4	1	2	0		0
1865	5	1	2	0		0
1865	6	1	2	0		0
1868	11	1	3	0		0
1868	12	1	3	0		0
1873	9	0		0		1
1873	10	0		0		1
1873	11	0		0		1
1873	12	0		0		1
1874	1	0		0		1
1874	2	0		0		1
1874	3	0		0		1
1874	4	0		0		1
1874	5	1	2	0		1
1874	6	1	2	1	2	1
1874	7	1	2	0		1

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1874	8	1	2	0		1
1874	9	0		0		1
1874	10	0		0		1
1874	11	0		0		1
1874	12	1	2	0		1
1875	1	1	2	0		1
1875	2	1	2	0		1
1875	3	1	2	0		1
1875	4	1	2	0		1
1875	5	1	2	0		1
1875	6	1	2	0		1
1875	7	1	2	0		1
1875	8	1	2	0		1
1875	9	1	2	0		1
1875	10	1	2	0		1
1875	11	1	2	0		1
1875	12	1	2	0		1
1876	1	1	2	0		1
1876	2	1	2	0		1
1876	3	1	2	0		1
1876	4	1	2	0		1
1876	5	1	2	0		1
1876	6	1	2	0		1
1876	7	1	2	0		1
1876	8	1	2	0		1
1876	9	1	2	0		1
1876	10	1	2	0		1
1876	11	1	2	0		1
1876	12	1	2	0		1
1877	1	1	2	0		1
1877	2	1	2	0		1
1877	3	1	2	0		1
1877	4	1	2	0		1
1877	5	1	2	0		1
1877	6	1	2	0		1
1877	7	1	2	0		1
1877	8	1	2	0		1
1877	9	1	2	0		1
1877	10	1	2	0		1
1877	11	1	2	0		1

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1877	12	1	2	0		1
1878	1	1	2	0		1
1878	2	1	2	0		1
1878	3	1	2	0		1
1878	4	1	2	0		1
1878	5	1	2	0		1
1878	6	1	2	0		1
1878	7	1	2	0		1
1878	8	1	2	0		1
1878	9	1	2	0		1
1878	10	1	2	0		1
1878	11	1	2	0		1
1878	12	1	2	0		1
1879	1	1	2	0		1
1879	2	1	2	1	2	0
1879	3	1	2	0		0
1879	4	1	2	0		0
1879	5	1	3	0		0
1879	6	1	3	1	2	0
1879	7	1	2	0		0
1879	8	1	2	0		0
1879	9	1	2	0		0
1879	10	1	2	0		0
1879	11	1	2	0		0
1879	12	1	2	0		0
1880	1	1	2	0		0
1880	2	1	2	0		0
1880	3	1	2	0		0
1880	4	1	2	0		0
1880	5	1	2	0		0
1880	6	1	2	0		0
1880	7	1	2	0		0
1880	8	1	2	0		0
1880	9	1	2	0		0
1880	10	1	2	0		0
1880	11	1	2	0		0
1880	12	1	2	0		0
1881	1	1	2	0		0
1881	2	1	2	0		0
1881	3	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1881	4	1	2	0		0
1881	5	1	2	0		0
1881	6	1	2	0		0
1881	7	1	2	0		0
1881	8	1	2	0		0
1881	9	1	2	0		0
1881	10	1	2	1	2	0
1881	11	1	2	0		0
1881	12	1	2	0		0
1882	1	1	2	0		0
1882	2	1	2	0		0
1882	3	1	2	0		0
1882	4	1	2	0		0
1882	5	1	2	0		0
1882	6	1	2	0		0
1882	7	1	2	0		0
1882	8	1	2	0		0
1882	9	1	2	0		0
1882	10	1	2	0		0
1882	11	1	2	1	3	0
1882	12	1	2	0		0
1883	1	1	2	0		0
1883	2	1	2	0		0
1883	3	1	2	0		0
1885	3	0		1	3	0
1886	1	0		0		1
1886	5	1	3	0		0
1886	6	1	3	0		0
1888	8	0		0		1
1888	9	0		0		1
1888	10	0		1	2	1
1888	11	0		1	2	1
1888	12	0		1	2	1
1889	1	0		1	2	1
1889	2	0		1	2	1
1889	3	0		1	2	1
1889	4	0		1	2	1
1889	5	0		1	2	1
1889	6	0		1	2	1
1889	7	0		0		1

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1889	8	0		0		1
1889	9	0		0		1
1889	10	0		0		1
1889	11	0		0		1
1889	12	0		0		1
1890	1	0		0		1
1890	2	0		0		1
1890	3	0		0		1
1891	6	0		1	3	0
1891	7	0		1	3	0
1891	8	0		1	3	0
1892	7	1	2	0		0
1892	8	1	2	0		0
1892	9	1	2	0		0
1892	10	1	2	0		0
1892	11	1	2	1	2	0
1892	12	1	2	0		0
1893	1	0		1	2	0
1893	4	1	2	0		0
1893	5	1	2	0		0
1893	6	1	2	0		0
1893	7	1	2	0		0
1893	8	1	2	0		0
1893	9	1	2	0		0
1893	10	1	2	0		0
1893	11	1	2	1	2	0
1893	12	1	2	0		0
1894	1	1	2	0		0
1894	2	1	2	0		0
1894	3	1	2	0		0
1894	4	1	2	0		0
1894	5	1	2	0		0
1894	6	1	2	0		0
1894	7	1	2	0		0
1894	8	1	2	0		0
1894	9	1	2	0		0
1894	10	1	2	0		0
1894	11	1	2	0		0
1894	12	1	2	0		0
1895	1	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1895	2	1	2	0		0
1895	3	1	2	1	2	0
1895	4	1	2	0		0
1895	5	1	2	0		0
1895	6	1	2	0		0
1895	7	1	2	0		0
1895	8	1	2	0		0
1895	9	1	2	0		0
1895	10	1	2	0		0
1895	11	1	2	0		0
1895	12	1	2	0		0
1896	1	1	2	0		0
1896	2	1	2	0		0
1896	3	1	2	0		0
1896	4	1	2	0		0
1896	5	1	2	0		0
1896	6	1	2	0		0
1896	7	1	2	1	2	0
1896	8	1	2	0		0
1896	9	1	2	0		0
1896	10	1	2	0		0
1896	11	1	2	0		0
1896	12	1	2	0		0
1897	1	1	2	0		0
1897	2	1	2	0		0
1897	3	1	2	0		0
1897	4	1	2	0		0
1897	5	1	2	0		0
1897	6	1	2	0		0
1897	7	1	2	1	2	0
1897	8	1	2	0		0
1897	9	1	2	0		0
1897	10	1	2	0		0
1897	11	1	2	0		0
1897	12	1	2	0		0
1898	1	1	2	0		0
1898	2	1	2	0		0
1898	3	1	2	0		0
1898	4	1	2	0		0
1898	5	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1898	6	1	2	0		0
1898	8	0		1	2	0
1899	7	1	3	0		0
1899	8	1	3	0		0
1900	8	0		1	2	0
1900	10	0		1	2	0
1903	1	0		1	2	0
1903	2	0		1	2	0
1903	3	0		1	2	0
1903	4	0		1	2	0
1903	5	0		1	2	0
1903	6	0		1	2	0
1903	11	0		1	2	0
1905	4	0		1	2	0
1906	4	0		1	2	0
1906	7	0		1	2	0
1907	1	0		1	3	0
1907	2	0		1	3	0
1907	3	0		1	3	0
1907	4	0		1	3	0
1907	5	0		1	3	0
1908	4	1	2	0		0
1910	3	1	2	0		0
1910	4	1	2	0		0
1910	12	1	2	0		0
1911	1	1	2	0		0
1911	2	1	2	0		0
1912	7	0		1	2	0
1912	8	1	3	1	2	0
1913	11	1	2	0		0
1913	12	1	2	0		0
1914	1	1	2	0		0
1914	2	1	2	0		0
1914	3	1	2	0		0
1914	4	1	2	0		0
1914	5	1	2	0		0
1914	6	1	2	0		0
1914	7	1	2	0		0
1914	8	1	2	0		0
1914	9	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1914	10	1	2	0		0
1914	11	1	2	0		0
1914	12	1	2	0		0
1915	1	1	2	0		0
1915	2	1	2	0		0
1915	3	1	2	0		0
1915	4	1	2	0		0
1915	5	1	2	0		0
1915	6	1	2	1	2	0
1915	7	1	2	1	2	0
1915	8	1	2	1	2	0
1915	9	1	2	1	2	0
1915	10	1	2	1	2	0
1915	11	1	2	1	2	0
1915	12	1	2	0		0
1916	1	1	2	0		0
1916	2	1	2	0		0
1916	3	1	2	0		0
1916	4	1	2	0		0
1916	5	1	2	0		0
1916	6	1	2	1	2	0
1916	7	1	2	1	2	0
1916	8	1	2	0		0
1916	9	1	2	0		0
1916	10	1	2	0		0
1916	11	1	2	0		0
1916	12	1	2	0		0
1917	1	1	2	0		0
1917	2	1	2	0		0
1917	3	1	2	0		0
1917	6	1	2	0		0
1917	7	1	2	0		0
1919	3	1	2	0		0
1919	4	1	2	0		0
1919	5	1	2	1	3	0
1919	6	1	2	0		0
1919	7	1	2	0		0
1919	8	1	2	0		0
1919	9	1	2	0		0
1919	10	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1919	11	1	2	0		0
1919	12	1	2	0		0
1920	1	1	2	0		0
1920	2	1	2	0		0
1920	3	1	2	0		0
1920	4	1	2	0		0
1920	5	1	2	0		0
1920	6	1	2	0		0
1920	7	1	2	0		0
1920	8	1	2	0		0
1920	9	1	2	0		0
1920	10	1	2	0		0
1920	11	1	2	0		0
1920	12	1	2	0		0
1921	1	1	2	0		0
1921	2	1	2	0		0
1921	3	1	2	0		0
1921	4	1	2	0		0
1921	5	1	2	0		0
1921	6	1	2	1	2	0
1921	7	1	2	0		0
1921	8	1	2	0		0
1921	9	1	2	0		0
1921	10	1	2	0		0
1921	11	1	2	0		0
1921	12	1	2	0		0
1922	1	1	2	0		0
1922	2	1	2	0		0
1922	3	1	2	0		0
1922	4	1	2	0		0
1922	5	1	2	0		0
1922	6	1	2	0		0
1922	7	1	2	0		0
1922	8	1	2	0		0
1922	9	1	2	0		0
1922	10	1	2	0		0
1922	11	1	2	0		0
1922	12	1	2	0		0
1923	1	1	2	0		0
1923	2	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1923	3	1	2	0		0
1923	4	1	2	0		0
1923	5	1	2	0		0
1923	6	1	2	0		0
1923	7	1	2	0		0
1930	2	0		1	2	0
1930	9	0		1	3	0
1930	10	0		1	3	0
1930	11	0		1	3	0
1930	12	0		1	3	0
1931	7	1	2	0		0
1931	8	1	2	0		0
1931	9	1	2	0		0
1931	10	1	2	0		0
1931	11	1	2	0		0
1931	12	1	2	0		0
1932	1	1	2	0		0
1932	2	1	2	0		0
1932	3	1	2	0		0
1932	4	1	2	0		0
1932	5	1	2	0		0
1932	6	1	2	0		0
1932	7	1	2	0		0
1932	8	1	2	0		0
1932	9	1	2	0		0
1932	10	1	2	0		0
1932	11	1	2	0		0
1932	12	1	2	0		0
1933	1	1	2	0		0
1933	2	1	2	0		0
1933	3	1	2	0		0
1933	4	1	2	0		0
1933	5	1	2	0		0
1933	6	1	2	0		0
1933	7	1	2	0		0
1933	8	1	2	0		0
1933	9	1	2	0		0
1934	2	0		1	2	0
1934	8	0		1	2	0
1935	7	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1935	8	1	2	0		0
1935	9	1	2	0		0
1935	10	1	2	0		0
1935	11	1	2	0		0
1935	12	1	2	0		0
1936	1	1	2	1	2	0
1936	2	1	2	0		0
1936	3	1	2	0		0
1936	4	1	2	0		0
1936	5	1	2	0		0
1936	6	1	2	0		0
1936	7	1	2	0		0
1936	8	1	2	0		0
1936	9	1	2	0		0
1936	10	1	2	0		0
1936	11	1	2	0		0
1936	12	1	2	0		0
1937	1	1	2	1	2	0
1937	2	1	2	0		0
1937	3	1	2	0		0
1937	4	1	2	0		0
1937	5	1	2	0		0
1937	6	1	2	0		0
1937	7	1	2	0		0
1937	8	1	2	0		0
1937	9	1	2	0		0
1937	10	1	2	0		0
1937	11	1	2	1	2	0
1937	12	1	2	0		0
1938	1	1	2	0		0
1938	2	1	2	0		0
1938	3	1	2	0		0
1938	4	1	2	0		0
1938	5	1	2	0		0
1938	6	1	2	0		0
1938	7	1	2	0		0
1938	8	1	2	0		0
1938	9	1	2	0		0
1938	10	1	2	0		0
1938	11	1	2	1	2	0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1938	12	1	2	1	2	0
1939	1	1	2	1	2	0
1939	2	1	2	1	2	0
1939	3	1	2	1	2	0
1939	4	1	2	1	2	0
1939	5	1	2	1	2	0
1939	6	1	2	1	2	0
1939	7	1	2	0		0
1939	8	1	2	0		0
1939	9	1	2	0		0
1939	10	1	2	0		0
1939	11	1	2	0		0
1939	12	1	2	0		0
1940	3	1	3	0		0
1940	4	1	3	0		0
1940	5	1	3	0		0
1940	6	1	3	0		0
1940	7	1	3	0		0
1940	8	1	3	0		0
1940	9	1	3	0		0
1940	10	1	3	0		0
1940	11	1	3	0		0
1940	12	1	3	0		0
1941	1	1	3	0		0
1941	2	1	3	0		0
1941	3	1	3	0		0
1941	4	1	3	0		0
1941	5	1	3	0		0
1941	6	1	3	0		0
1941	7	1	3	0		0
1941	8	1	3	1	2	0
1941	9	1	3	0		0
1941	10	1	3	0		0
1941	11	1	3	0		0
1941	12	1	3	0		0
1942	1	1	3	0		0
1942	2	1	3	0		0
1942	3	1	3	0		0
1942	4	1	3	0		0
1942	5	1	3	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1942	6	1	3	0		0
1942	7	1	2	0		0
1943	12	0		1	2	0
1944	1	0		1	2	0
1944	2	0		1	2	0
1944	8	0		1	2	0
1944	9	0		1	2	0
1944	10	0		1	2	0
1947	1	1	2	0		0
1947	2	1	2	0		0
1949	6	0		1	2	0
1949	12	1	2	0		0
1950	1	1	2	0		0
1950	10	0		1	2	0
1950	11	1	2	0		0
1950	12	1	2	0		0
1951	1	1	2	0		0
1951	2	1	2	0		0
1951	3	1	2	0		0
1951	4	1	2	1	2	0
1951	5	1	2	0		0
1951	6	1	2	0		0
1951	7	1	2	0		0
1951	8	1	2	0		0
1951	9	1	2	0		0
1951	10	1	2	0		0
1951	11	1	2	0		0
1951	12	1	2	0		0
1952	6	0		1	2	0
1953	7	1	2	0		0
1954	2	0		1	2	0
1954	3	0		1	2	0
1954	12	0		1	2	0
1955	1	0		1	2	0
1955	2	0		1	2	0
1955	3	0		1	2	0
1955	4	1	2	1	2	0
1955	5	1	2	1	2	0
1955	6	1	2	0		0
1955	7	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1955	8	1	2	0		0
1955	9	1	2	0		0
1955	10	1	2	0		0
1955	11	1	2	0		0
1955	12	1	2	0		0
1956	1	1	2	0		0
1956	2	1	2	0		0
1956	3	1	2	0		0
1956	4	1	2	0		0
1957	2	1	2	0		0
1957	3	1	2	0		0
1957	4	1	2	0		0
1957	5	1	2	0		0
1957	8	1	2	0		0
1957	9	1	2	0		0
1957	10	1	2	0		0
1957	11	1	2	0		0
1957	12	1	2	0		0
1958	1	1	2	0		0
1958	2	1	2	0		0
1958	3	1	2	0		0
1958	4	1	2	0		0
1958	5	1	2	0		0
1959	5	0		1	2	0
1959	10	1	3	0		0
1959	11	1	3	0		0
1959	12	1	3	0		0
1960	1	1	3	0		0
1960	2	1	3	0		0
1960	3	1	3	0		0
1960	4	1	3	0		0
1960	5	1	3	0		0
1960	6	1	3	0		0
1960	7	1	3	0		0
1960	8	1	3	0		0
1960	9	1	3	0		0
1960	10	1	3	0		0
1960	11	1	3	0		0
1960	12	1	3	0		0
1961	1	1	3	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1961	2	1	3	0		0
1961	3	1	3	0		0
1961	4	1	3	0		0
1961	5	1	3	0		0
1961	6	1	3	0		0
1961	7	1	3	0		0
1961	8	1	3	0		0
1961	9	1	3	0		0
1961	10	1	3	0		0
1961	11	1	3	0		0
1961	12	1	3	0		0
1962	1	1	3	0		0
1962	2	1	3	0		0
1962	3	1	3	0		0
1962	4	1	3	0		0
1962	5	1	3	0		0
1962	6	1	3	0		0
1962	7	1	3	0		0
1962	8	1	3	0		0
1962	9	1	3	0		0
1962	10	1	3	0		0
1962	11	1	3	0		0
1962	12	1	3	0		0
1963	1	1	3	0		0
1963	2	1	3	0		0
1963	3	1	3	0		0
1963	4	1	3	0		0
1963	5	1	3	0		0
1963	6	1	3	0		0
1963	7	1	3	0		0
1963	8	1	3	0		0
1963	9	1	3	0		0
1963	10	1	3	0		0
1963	11	1	3	0		0
1963	12	1	3	0		0
1964	1	1	3	0		0
1964	2	1	3	0		0
1964	3	1	3	0		0
1964	4	1	3	0		0
1964	5	1	3	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1964	6	1	3	0		0
1964	7	1	3	0		0
1964	8	1	3	0		0
1964	9	1	3	0		0
1964	10	1	3	0		0
1964	11	1	3	0		0
1964	12	1	3	0		0
1966	1	1	2	0		0
1966	2	1	2	0		0
1966	3	1	2	0		0
1966	4	1	2	1	2	0
1966	5	1	2	0		0
1966	6	1	2	0		0
1966	7	1	2	0		0
1966	8	1	2	0		0
1966	9	1	2	0		0
1966	10	1	2	0		0
1966	11	1	2	0		0
1966	12	1	2	0		0
1967	1	1	2	0		0
1967	2	1	2	0		0
1967	3	1	2	0		0
1967	4	1	2	0		0
1967	5	1	2	0		0
1967	6	1	2	0		0
1967	7	1	2	0		0
1967	8	1	2	0		0
1967	9	1	2	0		0
1967	10	1	2	0		0
1967	11	1	2	0		0
1967	12	1	2	0		0
1968	1	1	2	0		0
1968	2	1	2	0		0
1968	3	1	2	0		0
1968	4	1	2	0		0
1968	5	1	2	0		0
1968	6	1	2	0		0
1968	7	1	2	0		0
1968	8	1	2	0		0
1968	9	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1968	10	1	2	0		0
1968	11	1	2	0		0
1968	12	1	2	0		0
1969	1	1	2	0		0
1969	2	1	2	0		0
1969	3	1	2	0		0
1969	4	1	2	0		0
1969	5	1	2	0		0
1969	6	1	2	0		0
1969	7	1	2	0		0
1969	8	1	2	0		0
1969	9	1	2	0		0
1969	10	1	2	0		0
1969	11	1	2	0		0
1969	12	1	2	0		0
1970	1	1	2	0		0
1970	2	1	2	0		0
1970	3	1	2	0		0
1970	4	1	2	0		0
1970	5	1	2	0		0
1970	6	1	2	0		0
1970	7	1	2	0		0
1970	8	1	2	0		0
1970	9	1	2	0		0
1970	10	1	2	0		0
1970	11	1	2	0		0
1970	12	1	2	0		0
1971	1	1	2	0		0
1971	3	0		1	2	0
1971	4	1	2	1	2	0
1971	5	1	2	1	2	0
1971	6	1	2	0		0
1971	9	1	2	0		0
1971	10	1	2	0		0
1971	11	1	2	0		0
1971	12	1	2	0		0
1972	1	1	2	0		0
1972	2	1	2	0		0
1972	3	1	2	0		0
1972	4	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1972	5	1	2	0		0
1972	6	1	2	0		0
1972	7	1	2	0		0
1972	8	1	2	0		0
1972	9	1	2	0		0
1972	10	1	2	0		0
1972	11	1	2	0		0
1972	12	1	2	0		0
1973	1	1	2	0		0
1973	2	1	2	0		0
1973	3	1	2	0		0
1973	4	1	2	0		0
1973	5	1	2	0		0
1973	6	1	2	0		0
1973	7	1	2	0		0
1973	8	1	2	0		0
1973	9	1	2	0		0
1973	10	1	2	0		0
1973	11	1	2	0		0
1973	12	1	2	0		0
1974	1	1	2	0		0
1974	2	1	2	0		0
1974	3	1	2	0		0
1974	4	1	2	0		0
1974	5	1	2	0		0
1974	6	1	2	0		0
1974	7	1	2	0		0
1974	8	1	2	0		0
1974	9	1	2	0		0
1974	10	1	2	0		0
1974	11	1	2	0		0
1974	12	1	2	0		0
1975	1	1	2	0		0
1975	2	1	2	0		0
1975	3	1	2	0		0
1975	4	1	2	0		0
1975	5	1	2	0		0
1975	6	1	2	0		0
1975	7	1	2	0		0
1975	8	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1975	9	1	2	0		0
1975	10	1	2	0		0
1975	11	1	2	0		0
1975	12	1	2	0		0
1976	1	1	2	0		0
1976	2	1	2	0		0
1976	3	1	2	0		0
1976	4	1	2	0		0
1976	5	1	2	0		0
1976	6	1	2	0		0
1976	7	1	2	0		0
1976	8	1	2	0		0
1976	9	1	2	0		0
1976	10	1	2	0		0
1976	11	1	2	0		0
1976	12	1	2	0		0
1977	1	1	2	0		0
1977	2	1	2	0		0
1977	3	1	2	0		0
1977	4	1	2	0		0
1977	5	1	2	0		0
1977	6	1	2	0		0
1977	7	1	2	0		0
1977	8	1	2	0		0
1977	9	1	2	0		0
1977	10	1	2	0		0
1977	11	1	2	0		0
1977	12	1	2	0		0
1978	1	1	2	0		0
1978	2	1	2	0		0
1978	3	1	2	0		0
1978	4	1	2	0		0
1978	5	1	2	0		0
1978	6	1	2	0		0
1978	7	1	2	0		0
1978	8	1	2	0		0
1978	9	1	2	0		0
1978	10	1	2	0		0
1978	11	1	2	0		0
1978	12	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1979	1	1	2	0		0
1979	2	1	2	0		0
1979	3	1	2	0		0
1979	7	1	2	0		0
1979	8	1	2	0		0
1979	9	1	2	0		0
1979	10	1	2	0		0
1979	11	1	2	0		0
1979	12	1	2	0		0
1980	1	1	2	0		0
1980	2	1	2	0		0
1980	3	1	2	0		0
1980	4	1	2	0		0
1980	5	1	2	0		0
1980	6	1	2	0		0
1980	7	1	3	0		0
1980	8	1	3	0		0
1980	9	1	3	0		0
1980	10	1	2	0		0
1980	11	1	2	0		0
1980	12	1	2	0		0
1981	1	1	2	0		0
1981	2	1	2	0		0
1981	3	1	2	0		0
1981	4	1	2	0		0
1981	5	1	2	0		0
1981	6	1	2	0		0
1981	7	1	2	0		0
1981	8	1	2	0		0
1981	9	1	2	0		0
1981	10	1	2	0		0
1981	11	1	2	0		0
1981	12	1	2	0		0
1982	1	1	2	0		0
1982	2	1	2	0		0
1982	3	1	2	0		0
1982	4	1	2	0		0
1982	5	1	2	0		0
1982	6	1	2	0		0
1982	7	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1982	8	1	2	0		0
1982	9	1	2	0		0
1982	10	1	2	0		0
1982	11	1	2	0		0
1982	12	1	2	0		0
1983	1	1	2	0		0
1983	2	1	2	0		0
1983	3	1	2	0		0
1983	4	1	2	0		0
1983	5	1	2	0		0
1983	6	1	2	0		0
1983	7	1	2	0		0
1983	8	1	2	0		0
1983	9	1	2	0		0
1983	10	1	2	0		0
1983	11	1	2	0		0
1983	12	1	2	0		0
1984	1	1	2	0		0
1984	2	1	2	0		0
1984	3	1	2	0		0
1984	4	1	2	0		0
1984	5	1	2	0		0
1984	6	1	2	0		0
1984	7	1	2	0		0
1984	8	1	2	0		0
1984	9	1	2	0		0
1984	10	1	2	0		0
1984	11	1	2	0		0
1984	12	1	2	0		0
1985	1	1	2	0		0
1985	2	1	2	0		0
1985	3	1	2	0		0
1985	4	1	2	0		0
1985	5	1	2	0		0
1985	6	1	2	0		0
1985	7	1	2	0		0
1985	8	1	2	0		0
1985	9	1	2	0		0
1985	10	1	2	0		0
1985	11	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1985	12	1	2	1	2	0
1986	1	1	2	1	2	0
1986	2	1	2	1	2	0
1986	3	1	2	1	2	0
1986	4	1	2	1	2	0
1986	5	1	2	0		0
1986	6	1	2	0		0
1986	7	1	2	0		0
1986	8	1	2	0		0
1986	9	1	2	0		0
1986	10	1	2	0		0
1986	11	1	2	0		0
1986	12	1	2	0		0
1987	1	1	2	0		0
1987	2	1	2	0		0
1987	3	1	2	0		0
1987	4	1	2	0		0
1987	5	1	2	0		0
1987	6	1	2	0		0
1987	7	1	2	0		0
1987	8	1	2	0		0
1987	9	1	2	0		0
1987	10	1	2	0		0
1987	11	1	2	0		0
1987	12	1	2	0		0
1988	1	1	2	0		0
1988	2	1	2	0		0
1988	3	1	2	0		0
1988	4	1	2	0		0
1988	5	1	2	0		0
1988	6	1	2	0		0
1988	7	1	2	0		0
1988	8	1	2	0		0
1988	9	1	2	0		0
1988	10	1	2	0		0
1988	11	1	2	0		0
1988	12	1	2	0		0
1989	1	1	2	0		0
1989	2	1	2	0		0
1989	3	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1989	4	1	2	0		0
1989	5	1	2	0		0
1989	6	1	2	0		0
1989	7	1	2	0		0
1989	8	1	2	0		0
1989	9	1	2	0		0
1989	10	1	2	0		0
1989	11	1	2	0		0
1989	12	1	2	0		0
1990	1	1	2	0		0
1990	2	1	2	0		0
1990	3	1	2	0		0
1990	4	1	2	0		0
1990	5	1	2	0		0
1990	6	1	2	0		0
1990	7	1	2	0		0
1990	8	1	2	0		0
1990	9	1	2	0		0
1990	10	1	2	0		0
1990	11	1	2	0		0
1990	12	1	2	0		0
1991	1	1	2	0		0
1991	2	1	2	0		0
1991	3	1	2	0		0
1991	4	1	2	0		0
1991	5	1	2	0		0
1991	6	1	2	0		0
1991	7	1	2	0		0
1991	8	1	2	0		0
1991	9	1	2	0		0
1991	10	1	2	0		0
1991	11	1	2	0		0
1991	12	1	2	0		0
1992	1	1	2	0		0
1992	2	1	2	0		0
1992	3	1	2	0		0
1992	4	1	2	0		0
1992	5	1	2	0		0
1992	6	1	2	0		0
1992	7	1	2	0		0

Table III. (*continued*).

year	month	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions
1992	8	1	2	0		0
1992	9	1	2	0		0
1992	10	1	2	0		0
1992	11	1	2	0		0
1992	12	1	2	0		0
1993	1	1	2	0		0
1993	2	1	2	0		0
1993	3	1	2	0		0

Table IV. Eruption (with VEI ≥ 2) occurrences by year between 0 and 1993 AD at Etna, Stromboli, and Vulcano. VEI = Volcanic Explosivity Index; 0 = no occurrence; 1 = occurrence. Data are from Simkin and Siebert (1994).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
252	1	3	0		0	
526	0		0		1	3
925	0		0		1	3
1157	1	2	0		0	
1160	1	2	0		0	
1164	1	2	0		0	
1194	1	2	0		0	
1222	1	2	0		0	
1250	1	2	0		0	
1329	1	3	0		0	
1333	1	2	0		0	
1350	1	2	0		0	
1381	1	2	0		0	
1408	1	3	0		0	
1444	1	2	0		1	3
1536	1	3	0		0	
1537	1	2	0		0	
1541	1	2	0		0	
1550	0		0		1	3
1554	1	2	0		0	
1558	0		1	2	0	
1566	1	2	0		0	
1595	1	3	0		0	

Table IV.(*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1603	1	2	0		0	
1607	1	2	0		0	
1610	1	2	0		0	
1614	1	2	0		0	
1615	1	2	0		0	
1616	1	2	0		0	
1617	1	2	0		0	
1618	1	2	0		0	
1619	1	2	0		0	
1620	1	2	0		0	
1621	1	2	0		0	
1622	1	2	0		0	
1623	1	2	0		0	
1624	1	2	0		0	
1626	0		0		1	3
1646	1	2	0		0	
1647	1	2	0		0	
1669	1	3	0		0	
1682	1	2	0		0	
1693	1	3	0		0	
1694	1	3	0		0	
1723	1	2	0		0	
1724	1	2	0		0	
1727	0		0		1	3
1731	0		0		1	3
1732	1	2	0		1	3
1733	1	2	0		1	3
1734	0		0		1	3
1735	1	2	0		1	3
1736	1	2	0		1	3
1737	0		0		1	3
1738	0		0		1	3
1739	0		0		1	3
1744	1	2	0		0	
1745	1	2	0		0	
1747	1	2	0		0	

Table IV. (*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1748	1	2	0		0	
1749	1	2	0		0	
1752	1	2	0		0	
1753	1	2	0		0	
1754	1	2	0		0	
1755	1	2	0		0	
1756	1	2	0		0	
1757	1	2	0		0	
1758	1	2	0		0	
1759	1	2	0		0	
1763	1	3	0		0	
1766	1	2	0		0	
1768	0		1	2	0	
1770	0		1	2	0	
1771	0		0		1	3
1778	0		1	2	0	
1780	1	2	0		1	2
1781	1	2	0		0	
1786	0		0		1	3
1787	1	4	0		0	
1791	1	2	0		0	
1792	1	3	0		0	
1793	1	3	0		0	
1797	1	2	0		0	
1798	1	2	0		0	
1799	1	2	0		0	
1800	1	2	0		0	
1801	1	2	0		0	
1802	1	2	0		0	
1803	1	2	0		0	
1804	1	2	0		0	
1805	1	2	0		0	
1806	1	2	0		0	
1807	1	2	0		0	
1808	1	2	0		0	
1809	1	2	0		0	

Table IV.(*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1811	1	2	0		0	
1812	1	2	0		0	
1819	1	3	0		0	
1822	0		1	3	1	2
1823	0		0		1	2
1828	1	2	0		0	
1829	1	2	0		0	
1830	1	2	0		0	
1831	1	2	0		0	
1832	1	2	0		0	
1833	1	2	1	2	0	
1838	1	2	0		0	
1839	1	2	0		0	
1842	1	2	0		0	
1843	1	2	0		0	
1850	0		1	2	0	
1852	1	2	0		0	
1853	1	2	0		0	
1855	0		1	2	0	
1856	0		1	2	0	
1863	1	2	0		0	
1864	1	2	0		0	
1865	1	2	1	2	0	
1868	1	3	0		0	
1873	0		0		1	3
1874	1	2	1	2	1	3
1875	0		0		1	3
1876	0		0		1	3
1877	0		0		1	3
1878	1	2	0		1	3
1879	1	3	1	2	1	3
1880	1	2	0		0	
1881	1	2	1	2	0	
1882	1	2	1	3	0	
1883	1	2	0		0	
1885	0		1	2	0	

Table IV. (*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1886	1	3	0		1	3
1888	0		1	2	1	3
1889	0		1	2	1	3
1890	0		0		1	3
1891	0		1	3	0	
1892	1	2	1	2	0	
1893	1	2	1	2	0	
1894	1	2	0		0	
1895	1	2	1	2	0	
1896	1	2	1	2	0	
1897	1	2	1	2	0	
1898	1	2	1	2	0	
1899	1	3	0		0	
1900	0		1	2	0	
1903	0		1	2	0	
1905	0		1	2	0	
1906	0		1	2	0	
1907	0		1	3	0	
1908	1	2	0		0	
1910	1	2	0		0	
1911	1	2	0		0	
1912	1	3	1	2	0	
1913	1	2	0		0	
1914	1	2	0		0	
1915	1	2	1	2	0	
1916	1	2	1	2	0	
1917	1	2	0		0	
1919	1	2	1	3	0	
1920	1	2	0		0	
1921	1	2	1	2	0	
1922	1	2	0		0	
1923	1	2	0		0	
1930	0		1	3	0	
1931	1	2	0		0	
1932	1	2	0		0	
1933	1	2	0		0	

Table IV. (*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1934	0		1	2	0	
1935	1	2	0		0	
1936	1	2	1	2	0	
1937	1	2	1	2	0	
1938	1	2	1	2	0	
1939	1	2	1	2	0	
1940	1	3	0		0	
1941	1	3	1	2	0	
1942	1	3	0		0	
1943	0		1	2	0	
1944	0		1	2	0	
1947	1	2	0		0	
1949	1	2	1	2	0	
1950	1	2	1	2	0	
1951	1	2	1	2	0	
1952	0		1	2	0	
1953	1	2	0		0	
1954	0		1	2	0	
1955	1	2	1	2	0	
1956	1	2	0		0	
1957	1	2	0		0	
1958	1	2	0		0	
1959	1	3	1	2	0	
1960	1	3	0		0	
1961	1	3	0		0	
1962	1	3	0		0	
1963	1	3	0		0	
1964	1	3	0		0	
1966	1	2	1	2	0	
1967	1	2	0		0	
1968	1	2	0		0	
1969	1	2	0		0	
1970	1	2	0		0	
1971	1	2	1	2	0	
1972	1	2	0		0	
1973	1	2	0		0	

Table IV. (*continued*).

year	Etna eruptions	VEI	Stromboli eruptions	VEI	Vulcano eruptions	VEI
1974	1	2	0		0	
1975	1	2	0		0	
1976	1	2	0		0	
1977	1	2	0		0	
1978	1	2	0		0	
1979	1	2	0		0	
1980	1	3	0		0	
1981	1	2	0		0	
1982	1	2	0		0	
1983	1	2	0		0	
1984	1	2	0		0	
1985	1	2	1	2	0	
1986	1	2	1	2	0	
1987	1	2	0		0	
1988	1	2	0		0	
1989	1	2	0		0	
1990	1	2	0		0	
1991	1	2	0		0	
1992	1	2	0		0	
1993	1	2	0		0	

Table V. Monthly totals of seismic moment (TM_0) for the Etnean and Aeolian areas, from January 1983 to December 2007 (*i.e.* 300 months). Seismic moments are computed from earthquake magnitudes provided in the INGV catalogue of earthquakes available online at www.ingv.it (Bollettino Sismico Italiano, Istituto Nazionale di Geofisica e Vulcanologia). Focal depth for the considered earthquakes is less than 30 km. 0 is where no records are available.

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1983	Jan.	0	0
1983	Feb.	0	0
1983	Mar.	8.61157E+21	0
1983	Apr.	0	0
1983	May	0	0
1983	Jun.	3.1335E+21	0
1983	Jul.	0	0
1983	Aug.	0	0

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1983	Sep.	0	2.21309E+21
1983	Oct.	3.68198E+21	2.21309E+21
1983	Nov.	0	0
1983	Dec.	0	0
1984	Jan.	0	7.53147E+20
1984	Feb.	0	0
1984	Mar.	0	0
1984	Apr.	0	0
1984	May	0	2.78612E+20
1984	Jun.	2.72893E+21	3.9355E+20
1984	Jul.	1.50272E+21	0
1984	Aug.	5.81437E+21	7.85236E+20
1984	Sep.	1.10917E+21	1.56675E+21
1984	Oct.	5.52259E+21	0
1984	Nov.	3.67231E+21	5.55904E+20
1984	Dec.	0	0
1985	Jan.	0	0
1985	Feb.	1.1714E+21	0
1985	Mar.	4.33707E+21	0
1985	Apr.	1.343E+21	0
1985	May	0	0
1985	Jun.	3.9355E+20	0
1985	Jul.	0	0
1985	Aug.	5.55904E+20	0
1985	Sep.	3.12608E+21	3.9355E+20
1985	Oct.	2.21835E+21	0
1985	Nov.	2.08488E+21	0
1985	Dec.	1.68442E+22	9.24872E+20
1986	Jan.	6.15005E+21	0
1986	Feb.	1.97242E+20	0
1986	Mar.	1.13198E+21	3.9355E+20
1986	Apr.	2.78612E+20	0
1986	May	7.10694E+21	2.21309E+21
1986	Jun.	3.77467E+20	1.97242E+20
1986	Jul.	3.26358E+21	0

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1986	Aug.	4.75854E+20	0
1986	Sep.	1.35443E+21	1.97242E+20
1986	Oct.	1.96846E+22	7.94256E+21
1986	Nov.	2.23793E+21	0
1986	Dec.	2.48313E+19	0
1987	Jan.	2.38492E+20	0
1987	Feb.	4.05612E+21	4.9545E+19
1987	Mar.	0	0
1987	Apr.	0	0
1987	May	6.76753E+20	9.88553E+19
1987	Jun.	9.88553E+19	0
1987	Jul.	4.18381E+20	0
1987	Aug.	1.12675E+21	2.96191E+20
1987	Sep.	8.84091E+20	5.55904E+20
1987	Oct.	6.99842E+19	9.88553E+19
1987	Nov.	3.28157E+20	0
1987	Dec.	4.9545E+19	2.67695E+20
1988	Jan.	3.13687E+20	0
1988	Feb.	3.50752E+19	0
1988	Mar.	0	5.18173E+21
1988	Apr.	1.40989E+21	2.36029E+21
1988	May	0	3.23671E+21
1988	Jun.	1.27126E+21	3.84779E+21
1988	Jul.	2.43216E+20	0
1988	Aug.	2.70863E+21	4.7803E+21
1988	Sep.	1.75792E+19	4.9545E+19
1988	Oct.	6.99842E+19	1.44361E+20
1988	Nov.	6.27679E+20	6.99842E+19
1988	Dec.	7.96041E+20	9.88553E+19
1989	Jan.	7.56663E+20	3.50752E+19
1989	Feb.	3.44341E+21	5.58018E+20
1989	Mar.	3.34351E+20	1.6884E+20
1989	Apr.	2.18737E+20	1.05059E+20
1989	May	6.41844E+20	2.18385E+20
1989	Jun.	2.37224E+21	1.39637E+20

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1989	Jul.	3.64362E+21	1.41525E+21
1989	Aug.	1.28044E+22	2.44696E+20
1989	Sep.	5.81645E+21	6.72162E+20
1989	Oct.	7.8372E+21	2.83997E+20
1989	Nov.	1.56675E+21	6.71243E+19
1989	Dec.	6.99842E+19	6.99842E+19
1990	Jan.	3.2323E+20	0
1990	Feb.	2.3495E+20	1.19391E+21
1990	Mar.	1.07113E+22	2.52683E+21
1990	Apr.	5.3811E+20	3.34819E+20
1990	May	1.63593E+21	4.9545E+19
1990	Jun.	2.78612E+20	0
1990	Jul.	6.50577E+20	0
1990	Aug.	1.43476E+21	2.48313E+19
1990	Sep.	3.21509E+21	1.63863E+21
1990	Oct.	1.69074E+20	4.18381E+20
1990	Nov.	7.01504E+19	1.05059E+20
1990	Dec.	4.36437E+20	0
1991	Jan.	2.78516E+21	1.69192E+20
1991	Feb.	3.80765E+20	0
1991	Mar.	1.39637E+20	0
1991	Apr.	1.58196E+21	7.03374E+20
1991	May	2.62578E+21	0
1991	Jun.	5.05719E+20	0
1991	Jul.	4.21968E+20	4.9545E+19
1991	Aug.	3.28049E+20	5.99065E+19
1991	Sep.	3.6788E+21	2.92271E+21
1991	Oct.	8.92828E+20	0
1991	Nov.	2.92217E+20	6.99842E+19
1991	Dec.	7.58078E+20	0
1992	Jan.	1.2995E+20	6.99842E+19
1992	Feb.	6.82522E+20	6.99842E+19
1992	Mar.	6.99842E+19	1.25758E+21
1992	Apr.	1.75792E+19	9.48155E+19
1992	May	3.45643E+20	1.40218E+20

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1992	Jun.	1.19813E+20	1.41266E+20
1992	Jul.	1.97242E+20	4.28625E+20
1992	Aug.	9.88553E+19	1.39637E+20
1992	Sep.	1.57216E+20	1.89513E+20
1992	Oct.	0	0
1992	Nov.	0	4.63534E+20
1992	Dec.	0	3.9355E+20
1993	Jan.	0	2.58995E+21
1993	Feb.	6.99842E+19	4.9545E+19
1993	Mar.	4.9545E+19	2.28308E+21
1993	Apr.	1.19529E+20	1.97242E+20
1993	May	1.48635E+20	3.78461E+20
1993	Jun.	4.98609E+20	0
1993	Jul.	9.50481E+20	1.25316E+21
1993	Aug.	3.50456E+21	5.90792E+20
1993	Sep.	4.96627E+19	1.20803E+21
1993	Oct.	4.9545E+19	5.92524E+20
1993	Nov.	0	0
1993	Dec.	2.79274E+20	0
1994	Jan.	0	0
1994	Feb.	1.8968E+20	8.46202E+19
1994	Mar.	4.9545E+19	5.83666E+20
1994	Apr.	9.88553E+19	2.48313E+19
1994	May	1.42953E+21	5.05719E+20
1994	Jun.	8.47035E+19	6.99842E+19
1994	Jul.	5.99065E+19	4.70778E+21
1994	Aug.	6.99842E+19	0
1994	Sep.	2.53066E+21	1.44361E+20
1994	Oct.	3.89057E+20	2.94814E+21
1994	Nov.	2.80103E+20	5.59765E+21
1994	Dec.	7.81624E+20	5.92299E+20
1995	Jan.	1.75792E+19	9.88553E+19
1995	Feb.	6.44712E+21	2.38492E+20
1995	Mar.	0	0
1995	Apr.	0	3.58021E+20

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1995	May	3.19881E+20	0
1995	Jun.	9.48155E+19	0
1995	Jul.	1.39637E+20	5.6121E+22
1995	Aug.	8.22263E+20	1.25151E+22
1995	Sep.	2.48313E+19	5.33685E+20
1995	Oct.	2.38727E+20	9.51834E+20
1995	Nov.	9.88553E+19	4.9545E+19
1995	Dec.	7.87947E+19	0
1996	Jan.	9.909E+19	4.35734E+20
1996	Feb.	2.64367E+20	1.97242E+20
1996	Mar.	1.23687E+20	1.39637E+20
1996	Apr.	1.34014E+20	0
1996	May	0	5.7471E+20
1996	Jun.	9.48155E+19	1.38779E+21
1996	Jul.	6.99842E+19	8.24451E+20
1996	Aug.	1.2659E+21	1.97242E+20
1996	Sep.	6.27505E+20	6.25888E+20
1996	Oct.	0	0
1996	Nov.	5.23153E+20	0
1996	Dec.	2.12613E+21	0
1997	Jan.	3.36345E+21	3.9355E+20
1997	Feb.	4.74944E+21	8.45102E+20
1997	Mar.	4.92758E+20	1.25972E+21
1997	Apr.	1.25142E+21	0
1997	May	7.16238E+20	1.77135E+21
1997	Jun.	7.73346E+20	9.88553E+19
1997	Jul.	7.36677E+20	1.05059E+20
1997	Aug.	4.40469E+21	0
1997	Sep.	2.60291E+21	2.42808E+21
1997	Oct.	3.8698E+21	1.75792E+19
1997	Nov.	9.91181E+20	2.3411E+21
1997	Dec.	2.50586E+22	3.48596E+20
1998	Jan.	2.10765E+22	0
1998	Feb.	3.9807E+20	8.70253E+20
1998	Mar.	4.77556E+21	0

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
1998	Apr.	2.34619E+20	9.12398E+19
1998	May	2.2054E+21	0
1998	Jun.	6.07607E+20	6.79591E+20
1998	Jul.	2.38492E+20	4.43095E+20
1998	Aug.	1.0944E+21	1.39968E+20
1998	Sep.	6.75551E+20	5.7471E+20
1998	Oct.	4.30705E+20	0
1998	Nov.	1.44361E+20	0
1998	Dec.	2.34753E+21	0
1999	Jan.	6.46722E+20	4.18249E+20
1999	Feb.	2.18658E+21	6.53665E+20
1999	Mar.	2.01256E+21	2.59166E+20
1999	Apr.	5.63324E+20	1.97242E+20
1999	May	4.01157E+20	1.6884E+20
1999	Jun.	9.30161E+20	0
1999	Jul.	1.73232E+20	0
1999	Aug.	3.52873E+21	3.9355E+20
1999	Sep.	6.42838E+20	1.74712E+20
1999	Oct.	1.55728E+21	1.23687E+20
1999	Nov.	1.484E+20	0
1999	Dec.	4.18381E+20	2.01055E+20
2000	Jan.	1.3795E+21	0
2000	Feb.	1.93858E+21	0
2000	Mar.	1.71442E+20	0
2000	Apr.	6.5476E+20	2.54997E+21
2000	May	2.46787E+20	0
2000	Jun.	0	1.39637E+20
2000	Jul.	5.34921E+20	4.28625E+20
2000	Aug.	2.92692E+20	0
2000	Sep.	9.89385E+20	1.39637E+20
2000	Oct.	6.02056E+20	6.99842E+19
2000	Nov.	1.68763E+22	0
2000	Dec.	1.29617E+21	0
2001	Jan.	2.26636E+21	0
2001	Feb.	5.35177E+20	1.97242E+20

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
2001	Mar.	7.57161E+20	0
2001	Apr.	5.69959E+21	0
2001	May	4.65916E+21	1.75792E+19
2001	Jun.	3.43712E+20	4.9545E+19
2001	Jul.	5.18235E+22	1.14118E+22
2001	Aug.	1.68645E+21	8.69404E+20
2001	Sep.	2.48313E+19	8.5522E+20
2001	Oct.	5.96325E+21	5.69665E+20
2001	Nov.	0	7.85236E+20
2001	Dec.	6.99842E+19	0
2002	Jan.	3.28157E+20	0
2002	Feb.	1.74712E+20	1.39637E+20
2002	Mar.	3.28819E+20	1.3422E+21
2002	Apr.	2.09621E+20	9.86941E+21
2002	May	2.14345E+20	2.78612E+20
2002	Jun.	1.89513E+20	8.34516E+20
2002	Jul.	7.30429E+20	0
2002	Aug.	1.53444E+21	1.39637E+20
2002	Sep.	2.46787E+20	6.95541E+20
2002	Oct.	1.07678E+23	1.19529E+20
2002	Nov.	5.43328E+21	0
2002	Dec.	2.25681E+21	3.50752E+19
2003	Jan.	1.6884E+20	0
2003	Feb.	8.95013E+21	2.78612E+20
2003	Mar.	2.09621E+20	2.48313E+19
2003	Apr.	0	0
2003	May	1.39968E+20	0
2003	Jun.	1.97242E+20	5.75371E+20
2003	Jul.	1.95985E+21	0
2003	Aug.	2.78612E+20	0
2003	Sep.	0	0
2003	Oct.	2.18385E+20	0
2003	Nov.	0	1.6884E+20
2003	Dec.	1.6884E+20	0
2004	Jan.	2.32317E+20	1.6884E+20

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
2004	Feb.	7.65504E+20	0
2004	Mar.	8.92783E+20	2.50113E+21
2004	Apr.	0	3.17562E+21
2004	May	7.57776E+20	2.39508E+20
2004	Jun.	2.20707E+21	6.99842E+19
2004	Jul.	1.39578E+21	1.14425E+21
2004	Aug.	2.38824E+20	0
2004	Sep.	7.43764E+19	5.99065E+19
2004	Oct.	3.50752E+19	5.07524E+20
2004	Nov.	9.88553E+19	8.46202E+19
2004	Dec.	6.99842E+19	0
2005	Jan.	1.97242E+20	7.85236E+20
2005	Feb.	1.39637E+20	0
2005	Mar.	0	0
2005	Apr.	4.97243E+20	6.23735E+18
2005	May	9.48155E+19	3.10687E+19
2005	Jun.	4.38857E+19	1.79728E+19
2005	Jul.	3.44522E+21	1.75792E+19
2005	Aug.	1.42534E+21	4.24106E+19
2005	Sep.	3.50752E+19	1.24451E+19
2005	Oct.	7.30334E+21	1.45584E+21
2005	Nov.	2.63897E+19	3.61799E+20
2005	Dec.	7.227E+20	2.78612E+20
2006	Jan.	9.03744E+21	2.38166E+19
2006	Feb.	2.84242E+20	5.26544E+19
2006	Mar.	1.74146E+21	7.01504E+19
2006	Apr.	4.97334E+19	6.19877E+20
2006	May	6.12295E+21	4.58971E+21
2006	Jun.	6.12458E+21	4.17313E+20
2006	Jul.	2.22845E+20	1.10445E+19
2006	Aug.	2.56611E+20	1.62649E+21
2006	Sep.	8.24293E+19	3.0517E+20
2006	Oct.	1.55791E+20	5.70032E+20
2006	Nov.	7.19683E+20	3.23731E+19
2006	Dec.	1.84017E+22	3.42244E+21

Table V. (*continued*).

year	month	TM_0 Etna (dyn cm)	TM_0 Aeolian(dyn cm)
2007	Jan.	1.75792E+19	1.39637E+20
2007	Feb.	1.66358E+20	0
2007	Mar.	6.99842E+19	3.04503E+20
2007	Apr.	3.07995E+20	2.30905E+20
2007	May	4.97951E+20	3.9762E+21
2007	Jun.	2.11475E+20	1.2484E+20
2007	Jul.	4.4157E+18	9.56001E+20
2007	Aug.	4.98609E+20	4.57858E+20
2007	Sep.	1.75792E+19	3.45058E+21
2007	Oct.	2.96098E+20	2.60874E+20
2007	Nov.	5.99065E+19	1.64468E+20
2007	Dec.	7.95694E+19	1.39637E+20

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