

Table summary of the major explosions and paroxysms from 1970 to 2023 and comparison with the existing catalogs.

Supporting Material 1 to:

Catalog of major explosions and paroxysms at Stromboli (Italy) from 1970 to 2023.

Andrea Bevilacqua⁽¹⁾, Antonella Bertagnini⁽¹⁾, Massimo Pompilio⁽¹⁾, Patrizia Landi⁽¹⁾, Paola Del Carlo⁽¹⁾, Alessio Di Roberto⁽¹⁾, Alessandro Tadini⁽¹⁾, Caterina Piccione⁽²⁾, Susanna Falsaperla⁽³⁾, Salvatore Spampinato⁽³⁾, Augusto Neri⁽¹⁾

¹Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa, Pisa, Italy

²Istituto Nazionale di Geofisica e Vulcanologia, Amministrazione Centrale, Roma, Italy

³Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo – Sezione di Catania, Catania, Italy

Corresponding author: andrea.bevilacqua@ingv.it.

Note: **Bevilacqua et al. 2023** comprise 4 paroxysms, 51 major explosions, 34 uncertain major explosions, and 41 seismic sequences in 53 years from 1970 to October 2023.

In this summary we compared 14 pre-existing catalogs based on different characterizations of the phenomena and time spans. Bevilacqua et al. 2023 incorporates all the events in the pre-existing catalogs and a specific effort is focused on their harmonization, through a critical discussion on the characterization of the phenomena. Some of the catalogs also include events that occurred before 1970 and that are not considered in this document.

Here we briefly compare Bevilacqua et al. 2023 with the two catalogs longer than 50 years. A more detailed list of all the other catalogs is reported at the end of this document.

CATALOGS LONGER THAN 50 YEARS

Calvari & Nunnari 2023 – RemSens15, 6 paroxysms and 150 major explosions (3 uncertain) in 53 years from 1970 to June 2023. All the explosions in Bevilacqua et al. 2020 are incorporated, plus 64 additional events. Some dates include more than one explosion, which we counted as one.

In Bevilacqua et al. 2023, 4 of these events are characterized as paroxysms, 51 as major explosions, 33 as uncertain major explosions, 36 as seismic sequences and 32 as ordinary activity.

In addition, before June 2023 Bevilacqua et al. 2023 contains 1 uncertain major explosion and 4 seismic sequences.

Bevilacqua et al. 2020 – SciRep10, 4 paroxysms and 61 major explosions (1 uncertain) in 50 years from 1970 to July 2020.

In Bevilacqua et al. 2023, 4 of these events are characterized as paroxysms, 40 as major explosions, 11 as uncertain major explosions, 7 as seismic sequences, 3 as ordinary activity.

In addition, before July 2020 Bevilacqua et al. 2023 contains 2 major explosions, 20 uncertain major explosions and 26 seismic sequences.

Tab. 1 - Paroxysms, major explosions, uncertain major explosions and seismic sequences from 1970 to 1999.

| Year | Month | Day | Type of event | This catalog | Barberi et al. 1993 | Rosi et al. 2013 | Jaquet& Carniel, 2003 | Falsaperla& Spampinato, 2003 | Bertagnini et al. 1999; Cotelli et al. 2000 | Calvari& Nunnari, 2023 |
|-----------|-------|-----|---------------------------|--|---------------------|--------------------|------------------------|------------------------------|---|------------------------|
| 1970 | - | - | - | 0 events | 0 events | | | | | 0 events |
| 1971 | - | - | - | 0 events | 0 events | | | | | 1 major explosions |
| 1972 | 10 | 22 | seismic sequence | 1 major explosion 1 uncertain major explosion 1 seismic sequence | 2 major explosions | | | | | 2 major explosions |
| 1972 | 12 | 4 | major explosion | | | | | | | |
| 1972 | 12 | 14 | uncertain major explosion | | | | | | | |
| 1973 | - | - | - | 0 | 1 major explosion | | | | | 1 major explosion |
| 1974 | 9 | 19 | major explosion | 1 major explosion | 1 major explosion | | | | | 1 major explosion |
| 1975 | 11 | 4 | uncertain major explosion | 2 uncertain major explosions | 1 major explosion | | | | | 1 major explosion |
| 1975 | 11 | 5 | uncertain major explosion | | | | | | | |
| 1976-1984 | - | - | - | 0 events | 0 events | | | | | 0 events |
| 1985 | 6 | 27 | uncertain major explosion | 2 uncertain major explosions | 1 major explosion | | | 1 explosive sequence | | 2 major explosions |
| 1985 | 12 | 6 | uncertain major explosion | | | | | | | |
| 1986 | 4 | 23 | uncertain major explosion | 1 uncertain major explosion | 0 | | | 1 explosive sequence | | 1 major explosion |
| 1987 | - | - | - | 0 | 0 | | | 0 | | 0 |
| 1988 | 8 | 30 | major explosion | 1 major explosion | 1 major explosion | | | 1 explosive sequence | | 1 major explosion |
| 1989 | 3 | 7 | uncertain major explosion | 1 major explosion 3 uncertain major explosions | 1 major explosion | | | 4 explosive sequences | | 4 major explosions |
| 1989 | 3 | 20 | uncertain major explosion | | | | | | | |
| 1989 | 3 | 26 | major explosion | | | | | | | |
| 1989 | 4 | 3 | uncertain major explosion | | | | | | | |
| 1990 | 6 | 18 | major explosion | 1 major explosion | 2 major explosions | 1 | | 1 explosive sequence | | 2 major explosions |
| 1991 | - | - | - | 0 events | | 0 events | | 0 events | | 0 events |
| 1992 | 7 | 20 | uncertain major explosion | 1 uncertain major explosion | | 0 | | 1 explosive sequence | | 2 major explosions |
| 1992 | 9 | 1 | major explosion | | | | | | | |
| 1993 | 2 | 10 | major explosion | 2 major explosions 2 seismic sequences | | 2 major explosions | 2 "violent" explosions | 4 explosive sequences | | 5 major explosions |
| 1993 | 10 | 16 | major explosion | | | | | | | |
| 1993 | 10 | 30 | seismic sequence | | | | | | | |
| 1993 | 11 | 4 | seismic sequence | | | | | | | |
| 1994 | 6 | 4 | uncertain major explosion | 1 uncertain major explosion | | 0 events | 0 events | 1 explosive sequence | | 1 major explosion |

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|------|----|----|---------------------------|--------------------|------------------------------|--------------------|------------------------|------------------------|-----------------------|--------------------|--------------------|--|--|--|--|--|
| 1995 | 3 | 5 | major explosion | 2 major explosions | | 2 major explosions | 1 "violent" explosion | 2 explosive sequences | | 2 major explosions | | | | | | |
| 1995 | 5 | 10 | major explosion | | | | | | | | | | | | | |
| 1996 | 2 | 16 | major explosion | | 4 major explosions | | 4 major explosions | 3 "violent" explosions | 4 explosive sequences | 4 major explosions | 4 major explosions | | | | | |
| 1996 | 6 | 1 | major explosion | | | | | | | | | | | | | |
| 1996 | 6 | 6 | major explosion | | | | | | | | | | | | | |
| 1996 | 9 | 4 | major explosion | | | | | | | | | | | | | |
| 1997 | - | - | - | 0 events | | 0 events | 0 events | 0 events | | 0 events | | | | | | |
| 1998 | 1 | 16 | major explosion | 4 major explosions | | 6 major explosions | 6 "violent" explosions | 6 explosive sequences | 6 major explosions | 7 major explosions | | | | | | |
| 1998 | 8 | 23 | major explosion | | | | | | | | | | | | | |
| 1998 | 9 | 8 | major explosion | | 2 uncertain major explosions | | | | | | | | | | | |
| 1998 | 9 | 18 | seismic sequence | | | | | | | | | | | | | |
| 1998 | 11 | 24 | major explosion | | 1 seismic sequence | | | | | | | | | | | |
| 1998 | 12 | 26 | uncertain major explosion | | | | | | | | | | | | | |
| 1998 | 12 | 28 | uncertain major explosion | | | | | | | | | | | | | |
| 1999 | 3 | 13 | seismic sequence | 1 major explosions | | 1 major explosion | 3 "violent" explosions | 4 explosive sequences | | 6 major explosions | | | | | | |
| 1999 | 4 | 9 | uncertain major explosion | | | | | | | | | | | | | |
| 1999 | 8 | 25 | major explosion | | 4 uncertain major explosions | | | | | | | | | | | |
| 1999 | 10 | 10 | uncertain major explosion | | | | | | | | | | | | | |
| 1999 | 11 | 16 | uncertain major explosion | | 1 seismic sequence | | | | | | | | | | | |
| 1999 | 12 | 22 | uncertain major explosion | | | | | | | | | | | | | |

*Bevilacqua et al., (2020) follows Barberi et al., (1993) from 1970 to 1990, except for excluding 1973 May 5th and adding 1975 Nov. 5th.

Then Bevilacqua et al., (2020) follows Rosi et al., (2013) from 1991 to 1999.

Tab. 2 - Paroxysms, major explosions, uncertain major explosions and seismic sequences from 2000 to 2012.

| Year | Month | Day | Type of event | This catalog | Rosi et al. 2013 | Coltelli 2014 | Calvari et al. 2014 | Andronico et al. 2008 | Jaquet&Carniel, 2003 | Calvari&Nunnari, 2023 |
|------|-------|-----|---------------------------|--|--------------------|------------------------------------|---------------------|---|------------------------|---|
| 2000 | 7 | 4 | uncertain major explosion | 2 uncertain major explosions | 0 events | | | | 2 “violent” explosions | 2 major explosions |
| 2000 | 9 | 6 | uncertain major explosion | | | | | | | |
| 2001 | 10 | 20 | major explosion | 1 major explosion | 1 major explosion | | | | 1 “violent” explosion | 1 major explosion |
| 2002 | 1 | 23 | major explosion | 2 major explosions | 2 major explosions | | | | | 2 major explosions |
| 2002 | 7 | 24 | major explosion | | | | | | | |
| 2003 | 4 | 5 | paroxysm | 1 paroxysm | 1 paroxysm | | | | | 1 paroxysm 2 major explosions 1 uncertain major explosion |
| 2004 | 3 | 3 | uncertain major explosion | 1 uncertain major explosion 5 seismic sequences | 0 events | 1 “strong and wide” explosion | | 1 major explosion 5 “strong” explosions | | 4 major explosions |
| 2004 | 6 | 11 | seismic sequence | | | | | | | |
| 2004 | 9 | 16 | seismic sequence | | | | | | | |
| 2004 | 11 | 24 | seismic sequence | | | | | | | |
| 2004 | 12 | 7 | seismic sequence | | | | | | | |
| 2004 | 12 | 9 | seismic sequence | | | | | | | |
| 2005 | 1 | 9 | seismic sequence | 1 major explosion 4 seismic sequences | 1 major explosion | 1 major explosion | | 1 major explosion 7 “strong” explosions | 9 major explosions | |
| 2005 | 3 | 23 | seismic sequence | | | | | | | |
| 2005 | 5 | 9 | seismic sequence | | | | | | | |
| 2005 | 8 | 5 | major explosion | | | | | | | |
| 2005 | 11 | 12 | seismic sequence | | | | | | | |
| 2006 | 5 | 22 | seismic sequence | 1 uncertain major explosion 3 seismic sequences | 1 major explosion | 4 “strong” explosions | | 2 major explosions 1 “strong” explosion (Jan-Oct) | 3 major explosions | |
| 2006 | 6 | 16 | seismic sequence | | | | | | | |
| 2006 | 10 | 16 | seismic sequence | | | | | | | |
| 2006 | 12 | 15 | uncertain major explosion | | | | | | | |
| 2007 | 3 | 15 | paroxysm | 1 paroxysm | 1 paroxysm | 1 paroxysm 1 “strong” explosion | | | | 1 paroxysm |
| 2008 | 2 | 29 | major explosion | 2 major explosions 2 seismic sequences | 3 major explosions | 1 major explosion | 5 major explosions | | | 7 major explosions |
| 2008 | 7 | 9 | seismic sequence | | | | | | | |
| 2008 | 12 | 6 | major explosion | | | | | | | |
| 2008 | 12 | 17 | seismic sequence | | | | | | | |
| 2009 | 5 | 3 | major explosion | 3 major explosions | 3 major explosions | 3 major explosion | 3 major explosions | | | 4 major explosions |
| 2009 | 11 | 8 | major explosion | | | | | | | |
| 2009 | 11 | 24 | major explosion | | | | | | | |
| 2010 | 1 | 10 | major explosion | 3 major explosions 2 uncertain major explosions | 3 major explosions | 2 major explosions | 5 major explosions | | | 10 major explosions |
| 2010 | 1 | 14 | seismic sequence | | | | | | | |
| 2010 | 1 | 21 | major explosion | | | | | | | |
| 2010 | 3 | 12 | seismic sequence | | | | | | | |

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|------|----|----|---------------------------|------------------------------|--------------------|-----------------------|--------------------|--|--------------------|--------------------|
| 2010 | 6 | 25 | uncertain major explosion | 3 seismic sequences | | 5 "strong" explosions | | | | |
| 2010 | 6 | 30 | major explosion | | | | | | | |
| 2010 | 7 | 11 | seismic sequence | | | | | | | |
| 2010 | 12 | 19 | uncertain major explosion | | | | | | | |
| 2011 | 6 | 20 | uncertain major explosion | 1 major explosion | 4 major explosions | 3 major explosions | 8 major explosions | | | 9 major explosions |
| 2011 | 7 | 5 | major explosion | 3 uncertain major explosions | | | | | | |
| 2011 | 7 | 10 | uncertain major explosion | 2 seismic sequences | | | | | | |
| 2011 | 8 | 5 | seismic sequence | | | | | | | |
| 2011 | 8 | 15 | seismic sequence | | | | | | | |
| 2011 | 9 | 5 | uncertain major explosion | | | | | | | |
| 2012 | 2 | 15 | major explosion | 2 major explosions | 1 major explosion | 6 major explosions | | | 6 major explosions | |
| 2012 | 2 | 16 | seismic sequence | | | | | | | |
| 2012 | 3 | 6 | major explosion | 1 uncertain major explosion | | | | | | |
| 2012 | 7 | 26 | seismic sequence | 2 seismic sequences | | | | | | |
| 2012 | 11 | 22 | uncertain major explosion | | | | | | | |

*Bevilacqua et al., (2020) follows Rosi et al., (2013) from 2000 to 2011, and Coltelli (2014) in 2012.

Tab. 3 - Paroxysms, major explosions, uncertain major explosions and seismic sequences from 2013 to 2023.

| Year | Month | Day | Type of event | This catalog | Bevilacqua et al. 2020 | Giudicepietro et al. 2019 | Petrone et al. 2022 | Calvari et al. 2021 | UNIFI-LGS, 2022 | Calvari & Nunnari, 2023 |
|------|-------|-----|---------------------------|---|-----------------------------------|---------------------------------|-----------------------------------|---------------------|-----------------|-----------------------------------|
| 2013 | 12 | 4 | seismic sequence | 3 seismic sequences | 2 major explosions | | | | | 5 major explosions |
| 2013 | 12 | 14 | seismic sequence | | | | | | | |
| 2013 | 12 | 25 | seismic sequence | | | | | | | |
| 2014 | 1 | 4 | seismic sequence | 0 major explosions 1 seismic sequence | 1 major explosion | | | | | 3 major explosions |
| 2015 | 2 | 15 | seismic sequence | 0 major explosions 2 seismic sequences | 2 major explosions | | | | | 3 major explosions |
| 2015 | 7 | 16 | seismic sequence | | | | | | | |
| 2016 | - | - | - | 0 events | 0 events | | | | | 1 major explosion |
| 2017 | 7 | 26 | major explosion | 4 major explosions | 4 major explosions | 4 major explosions | | | | 4 major explosions |
| 2017 | 10 | 23 | major explosion | | | | | | | |
| 2017 | 11 | 1 | major explosion | | | | | | | |
| 2017 | 12 | 1 | major explosion | | | | | | | |
| 2018 | 3 | 7 | major explosion | 1 major explosion 3 uncertain major explosions 1 seismic sequence | 5 major explosions | 4 major explosions (Jan-Jun) | 5 major explosions | | | 5 major explosions |
| 2018 | 3 | 18 | uncertain major explosion | | | | | | | |
| 2018 | 4 | 24 | uncertain major explosion | | | | | | | |
| 2018 | 4 | 26 | uncertain major explosion | | | | | | | |
| 2018 | 8 | 18 | seismic sequence | | | | | | | |
| 2019 | 6 | 25 | major explosion | 2 paroxysms 2 major explosions | 2 paroxysms 2 major explosions | | 2 paroxysms 4 major explosions | | | 2 paroxysms 4 major explosions |
| 2019 | 7 | 3 | paroxysm | | | | | | | |
| 2019 | 8 | 28 | paroxysm | | | | | | | |
| 2019 | 8 | 29 | major explosion | | | | | | | |
| 2020 | 7 | 19 | major explosion | 3 major explosions 3 seismic sequences | 1 major explosion (Jan-Aug) | | 6 major explosions | 4 major explosions | | 6 major explosions |
| 2020 | 8 | 13 | seismic sequence | | | | | | | |
| 2020 | 11 | 10 | major explosion | | | | | | | |
| 2020 | 11 | 16 | major explosion | | | | | | | |
| 2020 | 11 | 21 | seismic sequence | | | | | | | |
| 2020 | 12 | 6 | seismic sequence | | | | | | | |
| 2021 | 3 | 1 | major explosion | 5 major explosions 1 uncertain major explosion | | | | 6 major explosions | | 7 major explosions |
| 2021 | 7 | 14 | major explosion | | | | | | | |
| 2021 | 7 | 28 | major explosion | | | | | | | |
| 2021 | 8 | 1 | major explosion | | | | | | | |
| 2021 | 9 | 11 | uncertain major explosion | | | | | | | |
| 2021 | 10 | 6 | major explosion | | | | | | | |
| 2022 | 5 | 7 | seismic sequence | 2 major explosions 2 uncertain | | | | 4 major explosions | | 5 major explosions |
| 2022 | 5 | 13 | major explosion | | | | | | | |
| 2022 | 5 | 25 | uncertain major | | | | | | | |

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|------|---|----|---------------------------|-----------------------------|--|--|--|--|--------------------|--------------------|
| | | | explosion | major explosion | | | | | | |
| 2022 | 7 | 25 | major explosion | | | | | | | |
| 2022 | 9 | 29 | uncertain major explosion | 1 seismic sequence | | | | | | |
| 2023 | 1 | 30 | seismic sequence | 1 uncertain major explosion | | | | | 5 major explosions | 4 major explosions |
| 2023 | 2 | 16 | seismic sequence | | | | | | | |
| 2023 | 3 | 25 | seismic sequence | | | | | | | |
| 2023 | 4 | 7 | uncertain major explosion | 4 seismic sequences | | | | | | |
| 2023 | 8 | 8 | seismic sequence | | | | | | | |

SUMMARY OF CATALOGS SHORTER THAN 50 YEARS

All incorporated in Bevilacqua et al. 2020 and/or Calvari & Nunnari, 2023.

Barberi et al. 1993 – ActaVulc3, 10 major explosions in 20 years from 1970 to 1990. Except for May 5th 1973, all the explosions are incorporated in Bevilacqua et al. 2020.

Bertagnini et al. 1999 – Eos80 and **Coltelli et al. 2000 – ActaVulc12**, 10 major explosions in 3 years from 1996 to 1998. All the explosions are incorporated in Bevilacqua et al. 2020.

Jaquet&Carniel 2003 – JVGR128, 18 “violent” explosions in 8 years from 1993 to 2001. Except for May 10th 1995 and Jun 6th 1996, the major explosions in Rosi et al. 2013 are listed, plus 4 additional events. All these explosions are incorporated in Calvari & Nunnari 2023, characterized as major explosions.

Falsaperla & Spampinato 2003 – JVGR125, 30 explosive sequences in 15 years from 1985 to 1999. Except for Dec 6th 1985, Apr 15th 1990 and Jan 16th 1998, the explosions in Barberi et al. 1993 and Rosi et al. 2013 are listed, plus 13 additional events. All these sequences are incorporated in Calvari & Nunnari 2023, characterized as major explosions.

Andronico et al. 2008 – JVGR176, 4 major explosions and 12 “strong” explosions in 3 years from 2004 to Oct 2006. Only 1 event, Aug 5th 2005, is comprised in Rosi et al. 2013 as a major explosion. Except for Jun 11th 2004 and Oct 16th 2006, all explosions are incorporated in Calvari & Nunnari 2023, characterized as major explosions.

Rosi et al. 2013 – GSL Mem37, 2 paroxysms and 34 major explosions in 21 years from 1990 to 2011. Except for excluding Apr 15th 1990, it starts where Barberi et al. 1993 stops. All the explosions are incorporated in Bevilacqua et al. 2020.

Calvari et al. 2014 – BullVolc76, 28 major explosions in 5 years from 2008 to 2012. Except for Mar 10th 2010, the explosions are incorporated in Calvari & Nunnari 2023.

INGV report – Coltelli 2014, 1 paroxysm, 12 major explosions, and 40 “strong” explosions (7 “strong and wide”) in 8 years from 2004 to 2012. The catalog does not indicate the event dates, but only the yearly count, and therefore a granular comparison with other catalogs is not feasible.

Giudicepietro et al. 2019 – RemSens11, 8 major explosions in 1.5 years from 2017 to Jun 2018. All the explosions are incorporated in Bevilacqua et al. 2020.

Calvari et al. 2021 – RemSens13, 6 major explosions in 1 year, in 2020. All the explosions are incorporated in Calvari & Nunnari 2023.

Petrone et al., 2022 – NatComm13, 9 major explosions in 2 years from 2018 to 2019. All the explosions are listed in Bevilacqua et al. 2020.

UNIFI-LGS reports (CME 2020-2023), 19 major explosions in 3 years from 2020 to 2023. Except Aug 8th 2023, all explosions until Jun 2023 are incorporated in Calvari & Nunnari 2023.