TITLE

Temporal correspondences between certain paroxysms in volcanic areas that show greater reactivity to high perigee New Moons, such as the Vesuvius–Campi Flegrei volcanic arc, and the main external sources of gravitational forces acting on the Earth

AUTHORS

Adriano Ballabene (software programmer, affiliate and Honorary Member of the Raffaele Bendandi Municipal Geophysical Observatory and House Museum in Faenza, Ravenna [1])

ABSTRACT

The Moon, the Sun, and Jupiter are the main external sources of gravitational forces acting on the Earth, influencing phenomena such as tides (Moon and Sun), satellite orbits, and, to a lesser extent, the orbital dynamics of the Earth–Moon system.

In the Vesuvius–Campi Flegrei volcanic arc, a correspondence can be observed between the highest perigee New Moons in conjunction with the Sun and the most significant phases of bradyseism, as well as the major eruptions of Vesuvius (79 AD) and within the caldera (1538). The severe 1982–1984 bradyseismic crisis was preceded and accompanied by three High New Moons at Super and Extreme Perigee occurring at the peak of the syzygy phase over Europe. In contrast, the current slower and more prolonged phase has developed during a distribution of seven High New Moons at only Minimum Perigee with “Central European” configurations.

The strongest seismic event since 1538—magnitude 4.6 on March 13, 2025—occurred five days after the greatest lunar culmination of the 2010–2040 period, and fifteen days before the High “Central European” New Moon at Super Perigee on March 29, 2025 (a Sun–Moon–Earth configuration most similar to that of March 30, 1538, which preceded the eruption by six months).

Among the 25,986 New Moons (Moon–Sun conjunctions) occurring during the astronomical period 0–2100, 1,437 fall under Extreme Perigee (lunar distance ≤ 0.35735 Gm), while there are 212 close Sun–Jupiter conjunctions with angular distance ≤ 0.2°. Both types of conjunction occurred simultaneously only twice: on December 21–23, 181, and December 22–23, 1367. Lowering the lunar distance threshold from 0.35735 Gm to 0.3567 Gm yields only one matching triple conjunction: Moon–Sun–Jupiter on December 21–23, 181.

1 The Scientific Council of the Raffaele Bendandi Observatory in Faenza is composed of University Professors, Senior Researchers, and Research Directors from CNR, INAF, INFN, INGV, and OV (https://www.osservatoriobendandi.it/wp-content/uploads/2021/04/Consiglio-Scientifico-1.pdf)

According to Wilson and Walker (1985) [2], the year 181 saw what is considered the most violent volcanic eruption on Earth in the past 5,000 years, initially attributed to the Taupo supervolcano.

The Moon–Sun–Jupiter conjunction with the most stringent parameters occurred in the year of the most violent historical eruption.

By extending the threshold from 0.3567 to 0.367 Gm, among the 12 occurrences we also find the following dates:

1302/06/26	32 days before the last eruption on Ischia (Campi Flegrei)
1712/01/08	28 days before an effusive eruption of Vesuvius
2025/06/25	(?)

At lunar distances ≤ 0.377 Gm, among the 19 combinations is also the date 1883/07/04, which preceded by 24 days the catastrophic Casamicciola earthquake (Campi Flegrei) and by 51 days the great Krakatoa eruption. At distances below 0.407 Gm and a minimum angular separation of 0.6°, among the 14 pairings between 1800 and 2070, August 1, 1943, stands out 5 months before the last eruption of Vesuvius (1944).

INTRODUCTION

The Earth “wobbles” slightly in its orbit around the Sun. Its trajectory is not perfectly elliptical but slightly undulated due to the influence of the Moon and Newtonian gravitational perturbations from the other planets.

The Moon has a significant mass, so it is actually the center of mass of the Earth–Moon system that follows a slightly undulating heliocentric orbit, rather than the Earth alone. As a result, the Earth “oscillates” with an amplitude of 4,671 km around a point located beneath its surface, about 1,700 km deep on the side facing its natural satellite.

Considering Earth’s daily 24-hour rotation, the position of this barycenter—4,671 km from the planet’s center—is not fixed within the Earth.

The Moon’s gravitational force acts on every part of the Earth (crust, mantle, and even core), but not uniformly. The part of the Earth closest to the Moon is attracted more strongly than the planet’s center, especially during syzygy phases (when the Earth, Moon, and Sun are aligned).

In the Vesuvius–Campi Flegrei volcanic arc, a correlation is detectable between high perigee New Moons in conjunction with the Sun and the most significant phases of

2 Wilson C. J. N., Walker G. P. L., The Taupo eruption, New Zealand. I. General aspects, in Phil Trans Roy Soc London, Serie A, n. 314, (1985), pp. 199-228

bradyseism, as well as the most notable eruptions of Vesuvius (79 AD) and within the caldera (1538) [3]: the severe bradyseismic crisis at Campi Flegrei during 1982–84 was preceded and accompanied by a peculiar sequence of three High New Moons at Super and Extreme Perigee, orbiting at the peak of the syzygy phase over Europe. In contrast, the current slower and more prolonged phase has occurred in coincidence with a unique distribution of seven “Central European” High New Moons at only Minimum Perigee; the strongest seismic shock since 1538 (magnitude 4.6, on March 13, 2025) occurred five days after the maximum lunar culmination of the 2010–2040 period, and fifteen days before the High Central European New Moon at Super Perigee of March 29, 2025—a Sun–Moon–Earth configuration most similar to that of March 30, 1538, which preceded the eruption by six months.

Between 1905 and 2025, the regular temporal correspondence between the occurrence of periodic daily lunar culminations lower than 75 degrees and the periodic phases of descending bradyseism has been disrupted (as shown at points 1 and 2 in Figure 1) by several High Perigee New Moons here defined as "Major" (points 1 and 2 in Figure 2), orbiting over Central Europe, in the northern sector bounded by meridians +1° and +25°, during the peak of the syzygy phase in relation to Earth’s rotational axis.

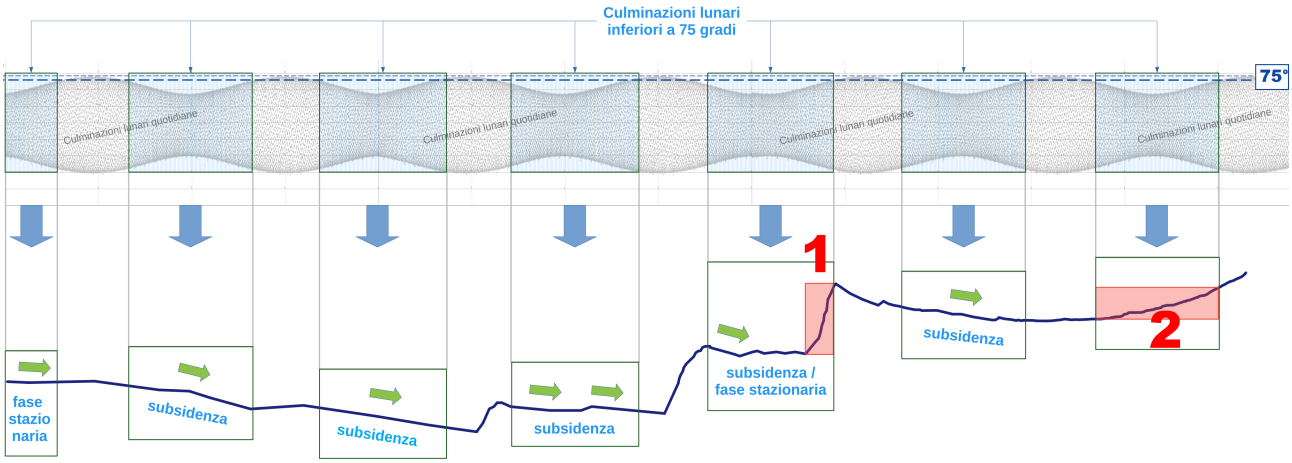


Fig. 1 *The regular correspondence between the periodic geometric lunar Culminations ≤ 75° at the top and the periodic descending bradyseismic phases at the bottom, disrupted at points 1 and 2 by the Major New Moons of* ***Fig. 2***

3 “Temporal correspondences in the period 1905-2023 between the bradyseismic trend at Campi Flegrei, the periods of lunar Culminations with Altitude above 75° and the New Moons in Perigee orbiting on the boreal segment delimited by the meridians +1° and +25°”, Adriano Ballabene, https://vixra.org/abs/2404.0094

Here, the 1538 eruption (VEI 3) is considered one of the two major Italian eruptions, at the expense of the sub-Plinian Vesuvius eruption of 1631 (VEI 4) and the Etna eruption of 1669 (VEI 4), because the VEI comparison is based on surface parameters. It is believed here that the energy of the deep processes in the case of the 1538 event was by far greater. This is evidenced by the millennial recurrence intervals of the Campi Flegrei caldera and the Plinian eruption of Vesuvius.

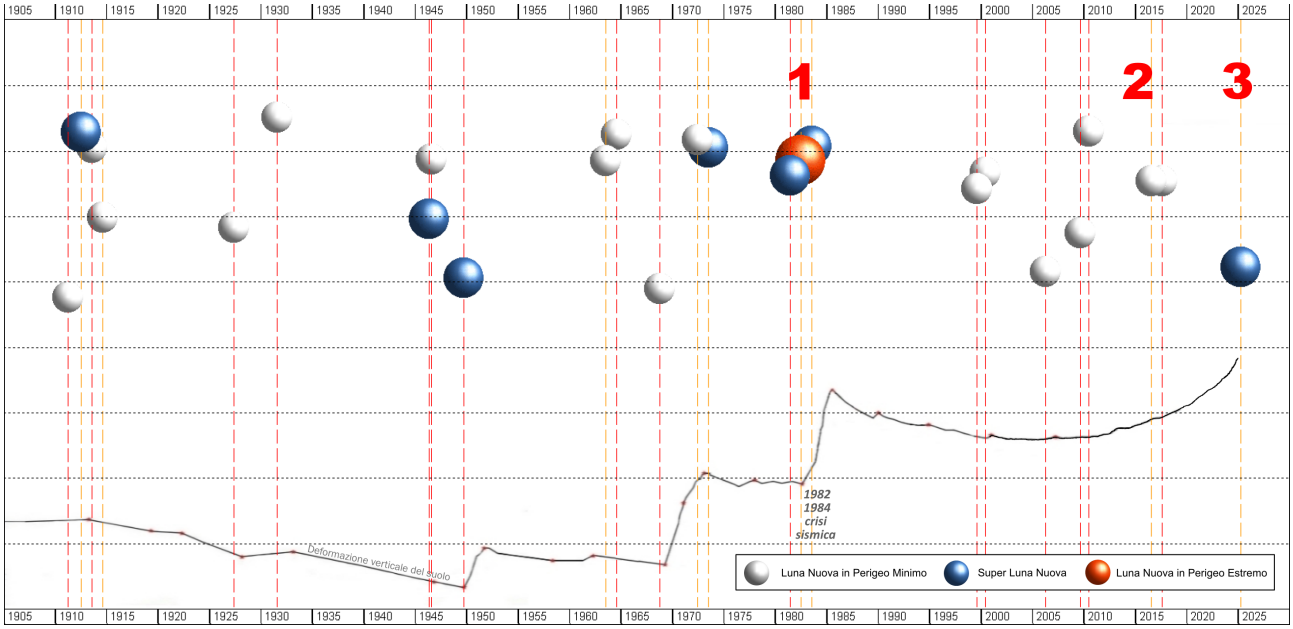


Fig. 2 *The 25 "Major" New Moons of the period 1905–2029 at the top and the bradyseismic trend at the Campi Flegrei from 1905 to 2024 at the bottom*

Other New Moons, here defined as Major, have historically disrupted the geophysical balance of the Vesuvius–Campi Flegrei volcanic arc, which appears to be particularly reactive to this type of external gravitational forcing on the planet. This is likely due to the peculiarity of the Italian territory, which is widely volcanic (also isolated from this perspective[4]), and because of the large extent of the Phlegraean caldera .

The 24 Major High New Moons shown in the 1905–2029 chart are to be understood as representative of the highest parametric concentration within a short period, during which numerous daily moons with high culminations and at least Minimum Perigee inevitably also occur, along with additional Major New Moons in the 1–2 months immediately before and after.

4 Excluding Greece, the volcanoes in Iceland, the Canary Islands, the Azores, and Turkey are located at considerable distances.

Preliminary comparison elements, partial temporal correspondences, interpretative premises

Throughout the entire period 0–2100, there are 36 New Moons (32 up to 2033) that have occurred between June 14 and 28 (June 21 ± 7 days, around the summer solstice, when the Earth's axial tilt allows the greatest lunar altitudes in the northern hemisphere), between the meridians 0° and +30°, during the peak of the syzygy phase relative to the Earth's axis (i.e., adopting a geocentric equatorial reference system), with declination on the equatorial plane greater than 0, orbiting at a distance less than 377,000 km from the Earth.
Excluding 21 remote and future dates, 2–3 of the remaining 11 dates correspond temporally with some significant events of the Vesuvius–Campi Flegrei volcanic arc.

```
 114/06/20
 133/06/20
 152/06/20
 204/06/15
 469/06/25
 497/06/16
 540/06/20
 559/06/21
 857/06/25
 866/06/16
 876/06/25
 885/06/16
 895/06/26
 904/06/16
1150/06/26
1221/06/21
1240/06/21
1264/06/25
1273/06/16
1292/06/16
1302/06/26 Ischia, July 28, 1302. The last eruption that produced the largest
           lava flow (of Arso) during this activity period.
           The syzygy culmination on the meridians of western Turkey (10:13)
1311/06/17 The syzygy culmination on the meridians of Moldova (UTC 10:09)
1557/06/26 To date, it is not possible to establish whether it anticipated the
           earthquake (and eruption) in Ischia the same year, which caused the
           collapse of the church in the village of Campagnano.
           The syzygy culmination on the meridians of Genoa (UTC 11:25)
1618/06/22 According to Lavizari in "History of Valtellina" (1838), at around
           midnight on September 4, 1618, following an earthquake, the mountain
           of Ciliano collapsed onto the town of Piuro, causing about a
           thousand victims. The earthquake is not confirmed.
```

The syzygy culmination on the meridians of Bologna (UTC 10:49)

1637/06/22 It preceded (but by as much as 9 months) the magnitude M 7.1 earthquake on March 27, 1638 in Calabria, which caused between 10,000 and 30,000 victims.

The syzygy culmination on the meridians of Gargano (UTC 10:56)

1656/06/22 On the night of January 29, 1657, a strong earthquake with an estimated magnitude M 6.0 hit the Gargano area: severe damage occurred in Lesina, as well as Apricena, Monte Sant'Angelo, San Severo, and Torremaggiore.

The syzygy culmination on the meridians of Modena (UTC 10:59)

1680/06/26 The syzygy culmination on the meridians of Moldova (UTC 10:06)

1699/06/27 Followed by a Mw 5.7 earthquake in Carnia but 13 months later.

The syzygy culmination on the meridians of central Egypt (UTC 10:01)

1708/06/18 No significant shocks followed June 18, 1708. It should be noted that the Moon reached its syzygy culmination on the 25th meridian crossing Crete and that between 1702 and 1706, the central Apennines were struck by a series of powerful seismic events (it could be called a seismic storm due to the sequence of shocks between Mw 6.6 and Mw 7.1 in the years 1688, 1693, 1694, 1702, 1703, 1703, 1706), so "the potential seismicity of the period may have been exhausted."

The syzygy culmination on the meridians of central Romania (10:19)

1963/06/21 Less than a month later, on July 19, 1963, a magnitude Mw 6.0 earthquake was recorded in the Ligurian Sea.

The syzygy culmination on the meridians of Vichy (UTC 11:46)

1982/06/21 Exactly around mid/end June 1982, according to a graph by Aster and Meyer (1988), the ascending bradyseism at the Campi Flegrei began, ending in the very early days of 1985.

The syzygy culmination on the meridians of Barcelona (UTC 11:53)

2025/06/25 (?)

The syzygy culmination on the meridians of eastern Greece (10:17)

At Campi Flegrei, during the last 2 years, some annual distances among the largest shocks can be noted:

- On September 26, 1537, one year and three days before the Monte Nuovo eruption on September 29, 1538, an earthquake caused severe damage in Pozzuoli (this was also the day when monthly culminations began to reach 75 degrees after about 11-12 years).
- On both May 19, 2024, and May 13, 2025, about one year apart, a magnitude 4.4 earthquake occurred at Campi Flegrei (a significant magnitude for the area).
- On April 14, 2024, and April 12, 2025, about one year apart, the highest magnitudes of the month were recorded, respectively M 3.7 and M 2.9[5].

5 Comparing the same months, the interval still corresponds to 12 ± 1 months.

- On February 17, 2024, and February 16, 2025, about one year apart, the highest magnitudes of the month were recorded, respectively M 3.0 and M 3.9.
- On January 21, 2024, and January 17, 2025, about one year apart, the highest magnitudes of the month were recorded, respectively M 2.6 and M 3.0.

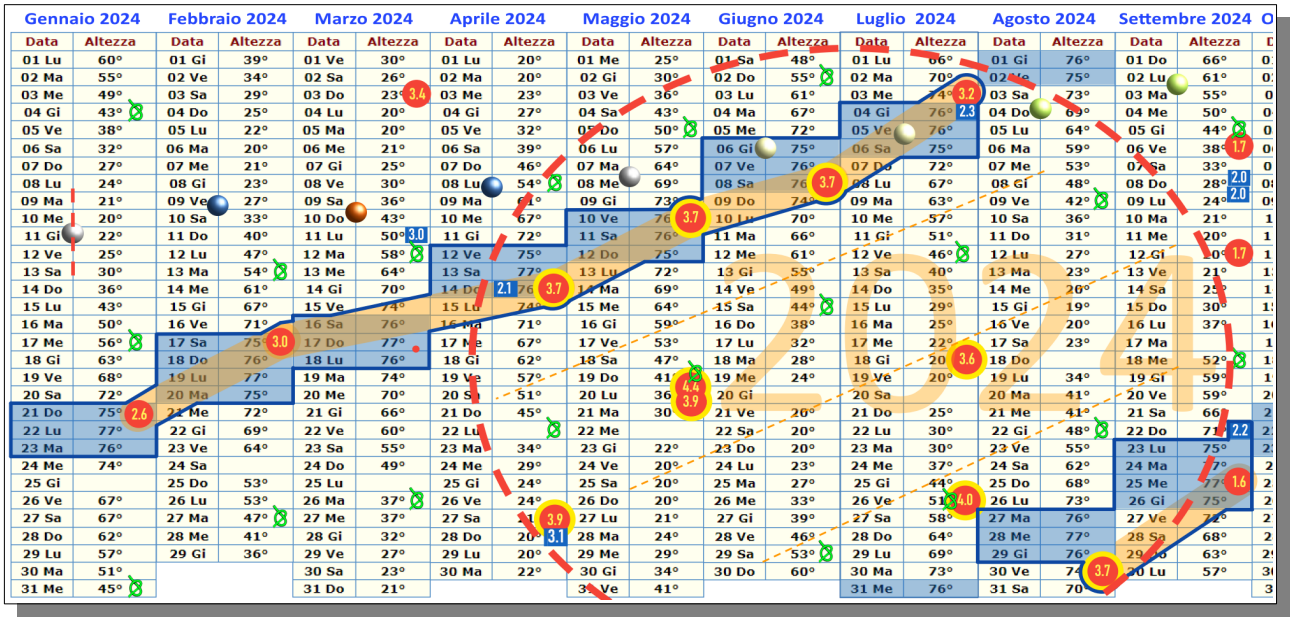


Fig. 3 January–September *2024*

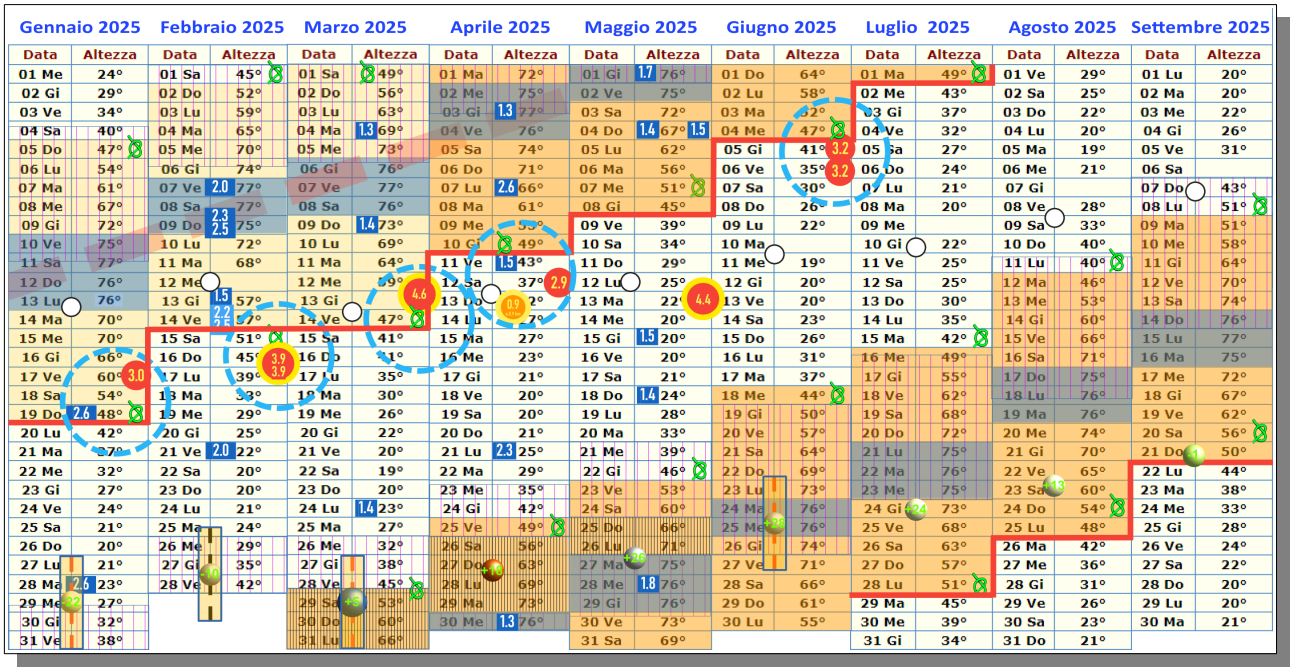


Fig. 4 January–September *2025*

DISCUSSION AND RESULTS

The Moon, the Sun, and Jupiter constitute the main external sources of gravitational forces acting on the Earth, influencing phenomena such as tides (Moon and Sun), satellite orbits, and to a lesser extent, the orbital dynamics of the Earth–Moon system.

Jupiter's gravitational influences on the Earth exist but are extremely weak compared to other forces acting on our planet, such as those from the Sun or the Moon. Over the very long term (millions of years), the combined gravitational effects of the giant planets (particularly Jupiter and Saturn) can contribute to small secular variations in the orbits of planets and satellites.

The Earth–Moon system is dynamically very stable, and variations are extremely slow; following combined gravitational perturbations, their mutual orbits dynamically readjust.

Jupiter is capable of periodically varying (approximately every 12 years) the position of the center of mass of the entire solar system, which often lies outside the Sun's radius. This variation of the barycenter is so significant that it is taken into account in precise planetary position calculations and space missions.

If Jupiter did not exist or had a different orbit, the gravitational perturbations of the other planets could make the lunar orbit less stable or even, over very long timescales, alter the Earth's rotational dynamics.

If the Earth were only a completely homogeneous solid body, if it did not have a very dense and massive core as large as the Moon and a geodynamically unstable crust with a thickness equivalent to the peel of an apple relative to the whole fruit, if it did not rotate on its axis, if it did not have a satellite of significant size, and if planetary perturbations acted only on the planet and not on the Earth–Moon double system, then one could simply recall that Jupiter causes only slow, long-term variations on the Earth's orbit. But the Earth is not alone, and the Earth–Moon system does not correspond to a point (at its center of mass) or to a homogeneous spherical body.

A demonstration of Jupiter's gravitational force effects beyond just orbital ones can be approached empirically by considering only extremely close alignments, as has been done in the Campi Flegrei with the "Central European" High New Moons between Earth and Sun.

Among the 25,986[6] New Moons (Moon–Sun) configured during the astronomical period 0–2100, those at Extreme Perigee (distance ≤ 0.35735 Gm) are 1,437, while there are 212[7] tight Sun–Jupiter conjunctions with a minimum angular distance of 0.2°.

The two types of conjunctions (New Moon (Moon–Sun) in Right Ascension at Extreme Perigee and Sun–Jupiter conjunction in Right Ascension, i.e., according to the Earth's rotation axis and a geocentric equatorial reference system) occurred simultaneously in only two instances: December 21–23, 181 and December 22–23, 1367.

Lowering the lunar distance threshold from 0.35735 to 0.3567 Gm, the matching returns only the Moon–Sun–Jupiter conjunction of December 21–23, 181. According to Wilson/Walker (1985)[8], in 181 the most violent eruption worldwide in the last 5,000 years occurred, initially attributed to the Taupo supervolcano.

The Moon–Sun–Jupiter conjunction with the most stringent parameters occurred in the year of the most violent historical eruption in the last 5,000 years.

By extending the lunar distance threshold from 0.3567 to 0.367 Gm, among the 12 occurrences are also the dates of:

1302/06/26	32 days before the last eruption on Ischia (Campi Flegrei). It was an important event in the geological history of the island. This was the last documented eruption.
1712/01/08	28 days before the first signs on February 5 of an effusive eruption of Vesuvius that lasted 126 days. It was one of many eruptions occurring in the 17th and 18th centuries and was not particularly violent. Historical sources do not report any confirmed casualties.
2025/06/25	(?)

```
1.   181/12/23 (?)       (~~TAUPO~~) The largest eruption of the last 5000 years
2.   353/06/17
3.   424/06/12
4.   495/06/08           ETNA Effusive eruptions:
```

6 Google Drive link to the .txt file https://drive.google.com/file/d/1hkMaC6wnmVn6vOn9J3VcikizzPfMAn1t/view
7 Google Drive link to the .txt file https://drive.google.com/file/d/1JDCt1olscb6j_oIrQxdDBD1hGIRPdB3Q/view
8 Wilson C. J. N., Walker G. P. L., The Taupo eruption, New Zealand. I. General aspects, (1985), pp. 199-228

		Piazza S. Alfio (dated 450±40 / 490–501) Bronte (dated 450±50) Fossa della Nave (dated 500±50) Due Monti (dated 500±50)
5.	1302/06/26 ISCHIA	Ischia, July 28, 1302. The last eruption that produced the largest lava flow (of Arso) during this activity period. According to Bonito, it was probably preceded by an earthquake, as Mons. Reggio, bishop of Vico Equense, reported that many buildings collapsed at that time.
6.	1367/12/22	
7.	1373/06/21	
8.	1438/12/16	EL MISTI (Peru) (dated 1454±16: 1438–1470, explosive/effusive eruption of VEI 2). It is considered the most recent strong historically documented volcanic activity of Misti.
9.	1509/12/11	POPOCATEPETL (Mexico). Details on intensity and consequences are scarce. According to historical reports and indigenous and colonial chronicles, Popocatépetl, one of Mexico's most active volcanoes, had a significant eruption in 1509. This event occurred shortly before the arrival of the Spanish in Mexico (Cortés landed in 1519) and was interpreted by the Aztecs as a bad omen. After 1509, Popocatépetl's volcanic activity increased starting from 1519, reaching a peak in 1530 with another notable eruption in 1539.
10.	1580/12/06	1600 HUAYNAPUTINA (Peru) The VEI 6 eruption of Huaynaputina in 1600 was one of the most powerful in the last 10,000 years, causing massive ash and gas emissions that had global climatic impacts, including temperature drops and severe famines in various parts of the world. It is estimated that more than 2 million people died of hunger during the so-called "Great Breadless Year" (famines in Russia 1601–1603).
11.	1712/01/08 VESUVIUS	VESUVIUS From February 5 to June 10. 126 days. Effusive eruption producing a lava flow towards Torre del Greco.
12.	2025/06/25 (?)	(?)

At distances less than 0.377 Gm, among the 19 combinations (in addition to the dates in the years 181, 1302, 1712, 2025, etc.), there is also the date July 4, 1883, which preceded by 24 days the catastrophic Mw 4.2 earthquake of Casamicciola (Campi Flegrei) on July 28 (2,313 victims) and by 51 days the great and historic VEI 6 eruption of Krakatoa on May 20, 1883, whose atmospheric wave reverberations were felt worldwide and caused 36,000 deaths.

Below 0.407 Gm and with a minimum angular distance of 0.6°, among the 14 pairings from 1800 to 2030 (in addition to the ones already mentioned), the date August 1, 1943 emerges, preceding by 5 months the last Vesuvius eruption (1944, 21 victims).

For the entire period 0–2100, only 2 New Moons occurred between June 14 and 28 (June 21 ± 7 days, around the summer solstice when the inclination of the Earth's axis allows the highest lunar altitudes in the northern hemisphere), between meridians 0° and +30° during the peak of the syzygy phase relative to the Earth's axis (i.e., adopting a geocentric equatorial reference system), with declination on the equatorial plane greater than 0, orbiting at a distance less than 377,000 km from Earth and occurring within ±2 days together with a tight Sun–Jupiter conjunction: June 25, 2025 and June 26, 1302, which preceded by 32 days the last eruption on Ischia (Campi Flegrei).

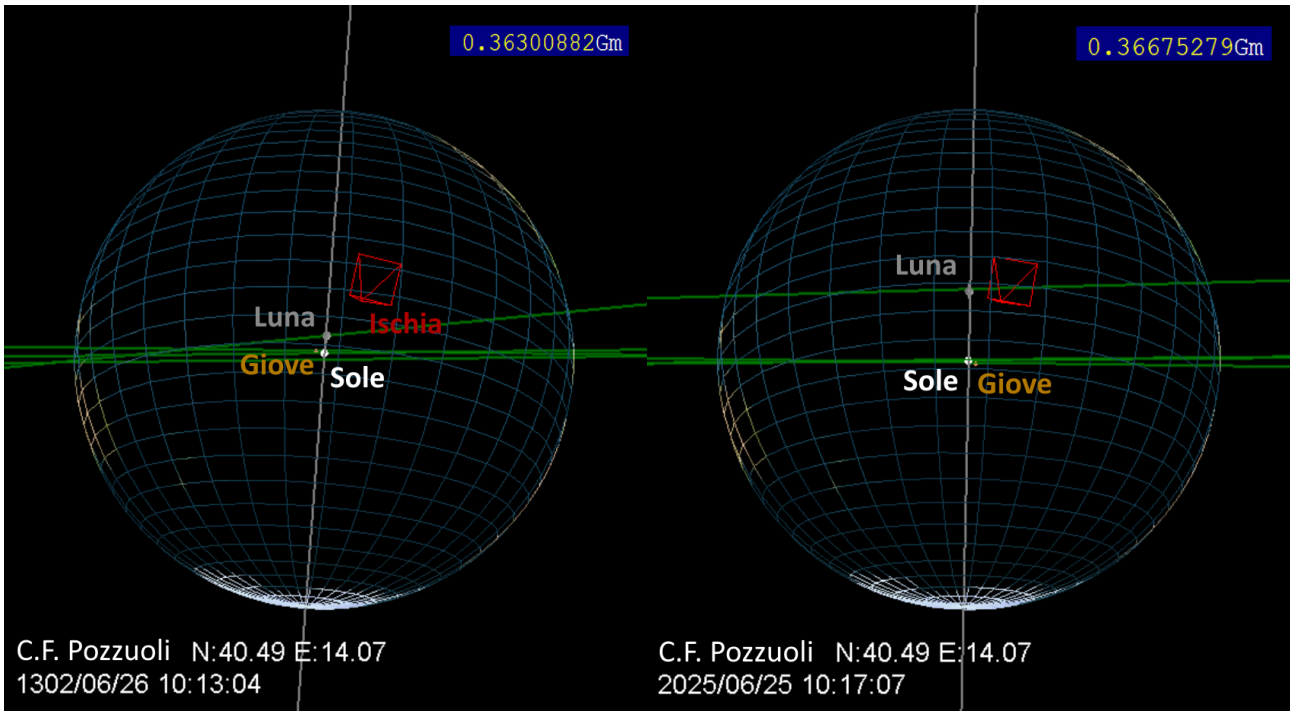


Fig. 5 *Moon, Sun, and Jupiter beyond planet Earth in wireframe on June 26, 1302. Ischia (more precisely Pozzuoli) located on the opposite hemisphere. (credits:* Solar System Simulator Studio *http://www.sssim.com/)*

Fig. 6 *Moon, Sun, and Jupiter beyond planet Earth in wireframe on June 25, 2025. Pozzuoli located on the opposite hemisphere. (credits:* Solar System Simulator Studio *http://www.sssim.com/)*

Only the dates June 26, 1302; June 26, 1557; and June 21, 1982 can be associated with the Campi Flegrei (the exact date of the 1557 eruption is not known), while four other dates are linked to sufficiently significant earthquakes.

The great eruption dated to 181 AD was initially attributed to the Taupo supervolcano located in the center of New Zealand's North Island. The year was estimated based on historical chronologies: some Chinese chronicles mention "red skies," "dry mists," and solar anomalies between 180 and 185 AD. Vague evidence of cold or unstable climate is also found in the West.

More recent studies on the Taupo volcano, based on dendrochronology (dating through tree rings) and tephrochronology (study of volcanic ash layers), have instead dated the VEI 6 (?) "Hatepe" eruption to 232 ± 5 AD[9]. There are indications of a major volcanic eruption in 181 AD, although it is not certain which volcano was responsible; it could have been a tropical or equatorial eruption for which there is not yet direct geological evidence[10].

(The vast majority of the world's most significant eruptions and largest earthquakes were not closely preceded by similar luni-solar-planetary configurations).

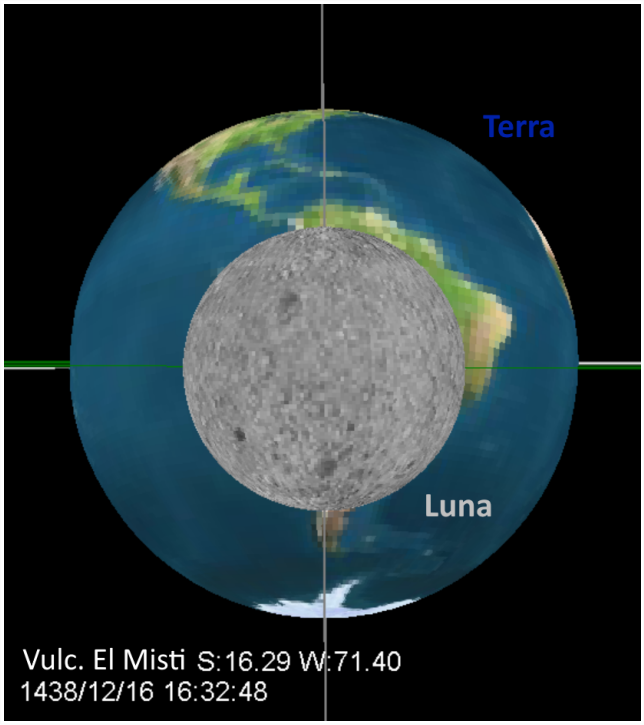


Fig. 7 Moon and Earth on December 16, 1438. The volcano El Misti is covered by the Moon in the New Moon phase and in conjunction with the Sun and Jupiter *(credits:* Solar System Simulator Studio *http://www.sssim.com/)*

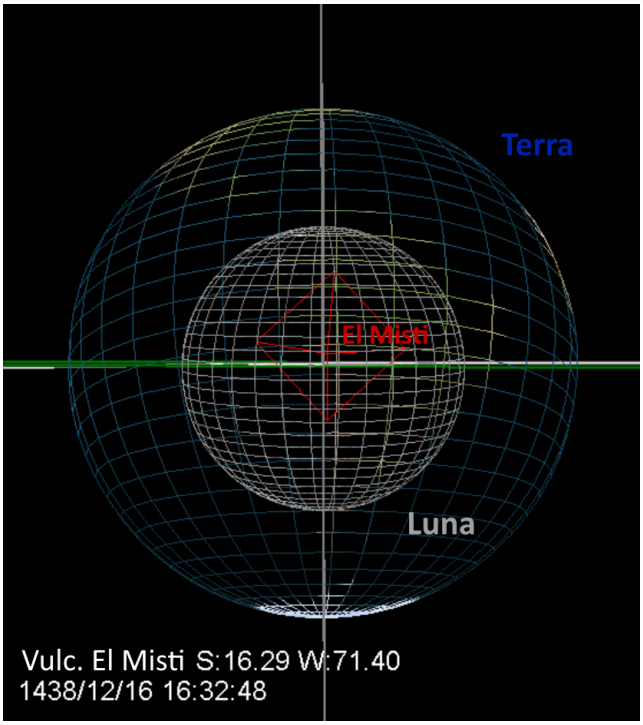


Fig. 8 *Moon and Earth on December 16, 1438. The position of the volcano is precisely overlain by the Moon at about 88 degrees altitude in the New Moon phase and in conjunction with the Sun and Jupiter.*

9 According to the Global Volcanism Program of the Smithsonian Institution National Museum of Natural History, the dating corresponds to March 15, 233 ± 13 years ± 20 days.

10 "*A new date for the Taupo eruption, New Zealand*", C. J. N. Wilson e altri, (1980) ; "*The Taupo eruption, New Zealand. I. General aspects*", in Phil Trans Roy Soc London, Wilson C. J. N., Walker G. P. L. (1985), pp. 199-228

CALCULATION METHOD AND TOOLS

To identify the Earth-Moon-Sun-Jupiter alignments over the last 2,101 years, the software Solex 12.1.01 (Solex, High Precision Ephemerides by Numerical Integration) was used — a celestial mechanics application with precision equivalent to the NASA/JPL Horizons online ephemeris system, developed by Prof. Aldo Vitagliano of the University Federico II of Naples (www.solexorb.it).

- The 25,058 New Moons (Moon-Sun conjunctions) occurring in the astronomical period 0–2100 relative to the Earth's axis were calculated using the following commands:

Enter	Continue
Enter	Continue
8	DE4068, no aster.
0	Jump to date 0/0/0
null	Step by 1 day
Y	Cl. Approaches, Close approaches
E	Moon–Sun, Calculate superior Moon–Sun conjunctions
10/C	Maximum angular distance, Conjunctions in R.A.
Y	Proceed
2101	Calculate until the beginning of the year 2101

  which produced the first data file **MINDIST.DAT** (https://drive.google.com/file/d/1hkMaC6wnmVn6vOn9J3VcikizzPfMAn1t/view)

- The 212 Sun–Jupiter conjunctions in the astronomical period 0–2100 were calculated with respect to the Earth's axis using Solex through the following commands:

Enter	Continue
Enter	Continue
8	DE4068, no aster.
0	Jump to date 0/0/0
null	Step by 1 day
/	Hide planets
Z	Hide all celestial bodies
0	Select the Sun
5	Select Jupiter
ESC	End, Exit
Y	Cl. Approaches, Close approaches
A	Angular, Angular Distance
0-5	Select Sun and Jupiter, or All with -1
0.2/C	Angular distance in degrees and Conjunction in R.A.
Y	Proceed
2101	Calculate until the beginning of the year 2101

  generating the second data file **MINDIST.DAT** (https://drive.google.com/file/d/1JDCt1olscb6j_olrQxdDBD1hGIRPdB3Q/view)

- Each line of the first file was scanned, considering exclusively the New Moons at Extreme Perigee ($r2 \leq 0.35735$ Gigameters). For each occurrence, every line of the second file **MINDIST.DAT** was read, searching for a Sun–Jupiter conjunction that occurred on the same day, allowing a tolerance of ±2 days.

CONCLUSIONS

An attempt was made to show if and how gravitational interactions between Jupiter and Earth may have sometimes influenced geophysical events such as earthquakes and volcanic eruptions. Some temporal correspondences were identified to understand whether the mechanisms behind certain geophysical phenomena might have had as significant causes the external gravitational forces acting on the planet, particularly those occurring in areas already clearly more reactive to certain sigizial lunar-solar configurations.

The correspondences found from scanning celestial coordinates are not numerous but are qualitatively significant. Among these, the New Moon was not described (because it was not Central European, having been configured over the USA at its culmination, as an eclipse) which preceded by only a few hours the Md 4.0 ± 0.3 quake on August 21, 2017, at Casamicciola (Ischia/Campi Flegrei), very similar to that of October 24, 78 AD (not 79), which might have contributed to the Vesuvius eruption that occurred exactly one year later.

In the entire period 0–2100, at least 4 of the 19 closest Moon-Sun-Jupiter conjunctions in Right Ascension (with minimum angular difference between Sun and Jupiter of 0.2°), and lunar distance less than 0.377 Gm, correspond with at least 5 significant geophysical events worldwide and in the Vesuvius-Campi Flegrei volcanic arc area, occurring on the following days:

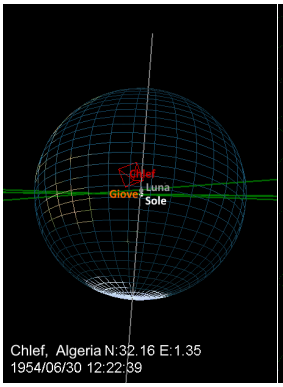
- 181/12/23 (probably followed by the most violent eruption in 5000 years dated 180–185 AD)
- 1302/06/26 (32 days before the last eruption at Ischia / Campi Flegrei)
- 1712/01/08 (28 days before the first manifestations on February 5 of an effusive eruption of Vesuvius lasting 126 days)
- 1883/07/04 (24 days before the catastrophic Mw 4.2 earthquake at Casamicciola / Campi Flegrei on July 28)
- 1883/07/04 (51 days before the great historic VEI 6 eruption of Krakatoa on May 20, 1883)

The correspondences amount to only 4 out of 19 conjunctions. However, they are considered qualitatively significant because the interval between the conjunctions and the events in the Vesuvius-Campi Flegrei area is always around 30 days; there is a 1:1 correspondence between the most violent eruption in the last 5000 years and the Moon-Sun-Jupiter conjunction with the strictest parameters; one of two conjunctions around the winter solstice (which allows the highest lunar-solar altitudes in the southern hemisphere) is linked to an eruption localized at southern

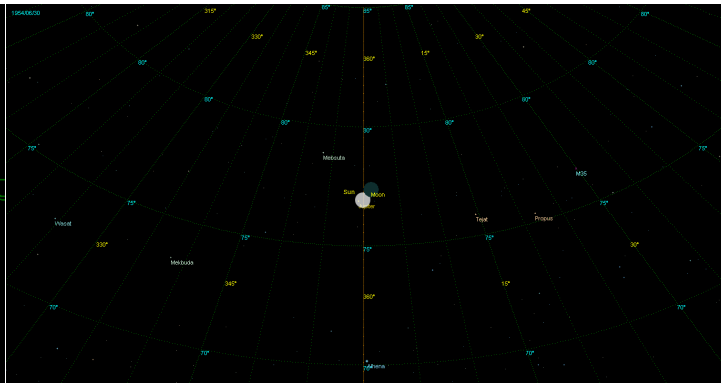
latitudes; two of two conjunctions around the summer solstice (which allows the highest lunar-solar altitudes in the northern hemisphere) are associated with events localized at northern latitudes

1.	181/12/23	20:21:44	0,356685
2.	282/06/22	23:36:02	0,367288
3.	353/06/17	21:33:56	0,363255
4.	418/12/13	14:22:17	0,373921
5.	424/06/12	20:51:10	0,360201
6.	489/12/08	11:03:52	0,368738
7.	495/06/08	19:20:18	0,358321
8.	1302/06/26	10:13:03	0,363009
9.	1367/12/22	01:36:56	0,357012
10.	1373/06/21	08:20:04	0,366723
11.	1438/12/16	23:52:23	0,358223
12.	1444/06/16	07:05:12	0,371186
13.	1509/12/11	21:53:23	0,360815
14.	1515/06/12	04:24:23	0,376411
15.	1580/12/06	19:25:19	0,364401
16.	1712/01/08	09:43:44	0,362704
17.	1883/07/04	15:50:59	0,376674
18.	1954/06/30	12:22:39	0,371406
19.	2025/06/25	10:17:06	0,366753

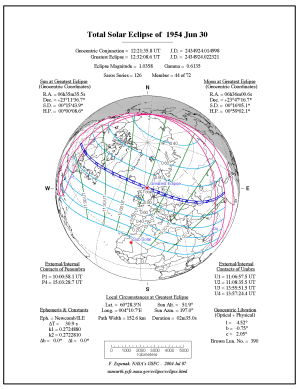
In the year 1954, on September 9, just over two months after the tight Moon-Sun-Jupiter conjunction of June 30, 1954, there was a magnitude 6.7 earthquake in Algeria (in the Northern Hemisphere). Similar earthquakes in the same area since 1973 have only occurred in 2003 (Mw 6.8) and in October 1980 (Mw 7.3). The New Moon of June 30 was configured as a total solar eclipse with maximum visibility over the northern seas of the United Kingdom and a sigizial culmination along the meridians crossing Morocco and Algeria.



The eclipse of June 30, 1954. (credits: Solar System Simulator Studio http://www.sssim.com/)



The eclipse of June 30, 1954. The Moon-Sun-Jupiter conjunction observed from Chlef (Algeria). (credits: Solex 12.1.01 High Precision Ephemerides by Numerical Integration, a software application of Celestial Mechanics developed by Prof. Aldo Vitagliano of the Federico II University of Naples) (www.solexorb.it)



The eclipse of June 30, 1954 https://eclipse.gsfc.nasa.gov

DATA GENERATORS

- Solex 12.1.01 High Precision Ephemerides by Numerical Integration by Prof. Aldo Vitagliano, Federico II University of Naples (www.solexorb.it)
- Solar System Simulator Studio vers. 1.1.6 2004-2006 (http://www.sssim.com/)

DATABASES

Osservatorio Vesuviano – Istituto di Geofisica e Vulcanologia INGV

(https://terremoti.ov.ingv.it/gossip/) (https://www.ov.ingv.it/) (https://www.ingv.it/)

KEYWORDS

Phlegraean Fields caldera, Campi Flegrei, tidal modulation, tidal tilting, crustal response to earth tides, seismic and volcanic activity, Jupiter, gravitational effect of Jupiter on some geophysical phenomena

REFERENCES

"Temporal correspondences in the period 1905-2023 between the bradyseismic trend at Campi Flegrei, the periods of lunar Culminations with Altitude above 75° and the New Moons in Perigee orbiting on the boreal segment delimited by the meridians +1° and +25°"

https://vixra.org/abs/2404.0094

PRELIMINARY OBSERVATIONS

"*Le eruzioni del Vesuvio nel 79 d.C. (Pompei) e del 1538 nella caldera del supervulcano Campi Flegrei (Monte Nuovo), ossia le due più rilevanti eruzioni nell'area partenopea dall'anno 1 d.C., sono state precedute (rispettivamente 5 e 6 mesi prima) da una Super Luna Nuova Massima Locale Boreale vale a dire da una Luna tra la Terra e il Sole in forte perigeo ad una distanza inferiore a 357.350 chilometri sui meridiani italiani durante il culmine (rispetto all'asse di rotazione della Terra e non solo al suo centro) della fase sigiziale, Luna configuratasi esclusivamente 14 volte negli ultimi 2020 anni* "

https://www.facebook.com/permalink.php?story_fbid=pfbid09zbP4vsramQ4tcf1zdbw1c7AZpkkWeBDEJn4xiyL5sRD5XPUEtfzS8YHtCP6cUYfl&id=1541025452819752

VERSIONE IN ITALIANO

"Corrispondenze temporali tra alcuni parossismi nelle aree vulcaniche con più evidenza reattive alle Lune Nuove Alte in Perigeo, come l'arco vulcanico Vesuvio-Campi Flegrei, e le principali sorgenti esterne di forze gravitazionali che agiscono sulla Terra"

https://drive.google.com/file/d/1NjKA18V4lJYpOByrK3sQDmcqIAZP9DPr/view