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Threat to Europe – analysis and consequences of the eruption of the Campi Flegrei supervolcano

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ABSTRACT

This article presents the threat to Poland and the Europe posed by the effects of the eruption of the Campi Flegrei supervolcano. The conflicts that have plagued Europe in the past and present are nothing compared to what await us. This analysis determines the consequences of the eruption of the active supervolcano, located in the Campi Flegrei Fields (Italian: Campi Flegrei), near Naples in central Italy. Global scientific research estimates that the Campi Flegrei supervolcano is coming to life, and a realistic scenario of its effects will cause climate change and another post-volcanic winter in Europe. The main problem with the impending catastrophe is that this process cannot be prevented.

***Keywords*:** supervolcano, Campi Flegrei Fields, volcanic winter, global chaos, local conflicts

1. INTRODUCTION

A supervolcano eruption can be thousands of times more powerful and destructive than the eruptions of ordinary volcanoes such as Mount Etna in Sicily or Kīlauea in Hawaii. Geological research suggests that supervolcanoes erupt at irregular intervals, but on average such events occur every few tens of thousands of years. The last documented eruption of the Lake Taupō supervolcano took place around 25,000 years ago in New Zealand.

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The famous Toba Caldera supervolcano in Indonesia unleashed its immense power some 75,000 years ago, altering the climate, atmospheric composition and levels of sunlight reaching the Earth [1-4].

Some of the best-known supervolcanoes today include:

- Campi Flegrei (Italy) [5-9],
- Laacher See (Germany) [10-12],
- Lake Taupō (New Zealand) [13-15],
- Toba Caldera (Indonesia) [2, 16-18],
- Yellowstone Caldera (USA) [19-21].

The most devastating known and documented volcanic catastrophe occurred in AD 79, when Mount Vesuvius destroyed the ancient city of Pompeii. Buried beneath layers of volcanic ash several metres deep, the ruined city has become an invaluable source of knowledge for archaeologists, who continue to uncover the secrets of this destruction to this day [22-24].

No reports concerning volcanic threats originating within Poland have been identified either in domestic or international scientific literature. Accordingly, this article relies on research relating to supervolcanoes published in leading international scientific journals, which discuss the nature and complexity of these phenomena on the basis of documented findings.

2. METHODOLOGY

Following a review of the scientific literature concerning volcanic hazards, the article focuses on the synthesis and analysis of such events, using the volcanic disaster that struck Pompeii in AD 79 as a point of reference, which is considered here merely a prelude to a supervolcanic eruption. The research problem is analytical in nature, covering both local and global perspectives, while the research methods focus on observation and monitoring of the process as a whole.

3. RESULTS AND DISCUSSION

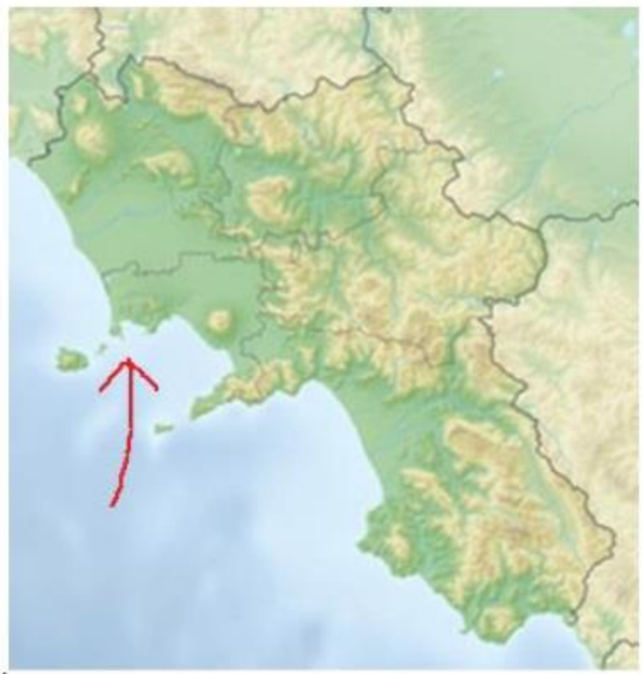
The catastrophe that struck Pompeii in AD 79 following the eruption of Mount Vesuvius was relatively minor compared with the supervolcano located beneath Campi Flegrei (Figs. A&B). This supervolcano, with a crater approximately 13 km in diameter, is not visible from the Earth's surface because its caldera is relatively flat. Its last major eruption occurred around 39,000 years ago. At that time, volcanic ash spread across almost the whole of Europe, western Asia, and northern Africa.

The extinction of the Neanderthals is dated to approximately the same period. Accordingly, it may be suggested that one of the consequences of this eruption was a volcanic winter.

An eruption of this magnitude releases enormous quantities of gases into the atmosphere, including sulphur dioxide, which reacts with water vapour to form sulphuric acid aerosols. By blocking sunlight and reflecting solar radiation, these gases trigger what is known as a volcanic winter, ultimately leading to glaciation.

Following a prolonged period of dormancy, the supervolcano beneath Campi Flegrei has begun to show signs of renewed activity. Since 2005, the Campi Flegrei caldera has exhibited progressive ground uplift. The uplift rate of 10 cm per year may be regarded as exceptionally high and indicative of rapid magma migration towards the upper part of the caldera. Furthermore, the high frequency of seismic events recorded in the region, with more than one thousand earthquakes documented in 2025, also indicates that a major catastrophe may be approaching [25, 26].

(A)



(B)

Figures A and B. Location of the supervolcano in the Campi Flegrei region (Google). 40°49′3″N 14°08′20″E

A supervolcanic eruption could continue for weeks or even months. Cubic kilometres of ash and volcanic dust released into the atmosphere during such an eruption would obscure the sky. For years, sunlight would be blocked, disrupting plant growth as one of the first consequences of the eruption. The resulting shortages of vegetables, fruit and cereal crops would adversely affect animal feed production and, consequently, human food production systems. The air would become difficult to breathe, while rivers and water reservoirs would be polluted by volcanic ash and dust.

3. 1. Security implications of a supervolcanic eruption

As a result of a supervolcanic eruption, European civilisations would gradually begin to collapse, while the human instinct for survival, currently largely dormant, would re-emerge. The security of Poland, as well as of Europe as a whole, would gradually deteriorate. It is difficult to describe a detailed pattern of human behaviour in such circumstances, particularly because this catastrophe would be both sudden and long-lasting. At present, it can only be theoretically assumed that a worst-case scenario would inevitably occur. Nevertheless, for central Italy, where the supervolcano is located, the consequences would resemble a catastrophe a thousand times greater than the destruction of Pompeii. The rest of Europe, including Poland, would be covered by a thick layer of volcanic ash.

Such a catastrophe has never occurred in modern Poland, therefore only a general outline of human behaviour can be proposed in the context of a survival instinct that could force people into actions such as:

- the looting of food stores and commercial premises by local residents,
- the formation of local gangs and criminal groups,
- conflicts and wars between gangs,
- armed robberies against civilians,
- the collapse of the current legal order, replaced instead by the age-old law of nature: the strongest and most cunning survive,
- crime increasing on a massive scale,
- emigration from Europe as people flee the effects of a volcanic winter.

4. CONCLUSIONS

It is difficult to imagine the scale of such a catastrophe and its consequences, yet natural disasters that strike the Earth are part of a natural and ongoing process. The greatest challenge posed by a looming catastrophe of this kind is that there is no way to prevent it. However, it is highly likely that the Southern Hemisphere would experience lower levels of environmental contamination. As a result, it could remain more hospitable to human life during such a difficult period.

References

[1] Alan Robock, (2000). Volcanic eruptions and climate. *Reviews of Geophysics* 38(2), 191-219. https://doi.org/10.1029/1998RG000054

[2] Bekki, S., J. A. Pyle, D. M. Pyle, (1996). The role of microphysical and chemical processes in prolonging the climate forcing of the Toba eruption, *Geophys. Res. Lett.* 23, 2669-2672. https://doi.org/10.1029/96GL02088

[3] Bradley, R. S. (1988). The explosive volcanic eruption signal in Northern Hemisphere continental temperature records. *Clim. Change*, 12, 221-243. https://doi.org/10.1007/BF00139431

[4] Crowley, T. J., K.-Y. Kim, (1999). Modeling the temperature response to forced climate change over the last six centuries. *Geophys. Res. Lett.* 26(13), 1901-1904. https://doi.org/10.1029/1999GL900347

[5] Vona A., C. Romano, D. Giordano, J.K. Russell, (2013). The multiphase rheology of magmas from Monte Nuovo (Campi Flegrei, Italy). *Chemical Geology,* 346, 213-227. https://doi.org/10.1016/j.chemgeo.2012.10.005

[6] Luca Caricchi, Daniele Giordano, Luigi Burlini, Peter Ulmer, Claudia Romano, (2008). Rheological properties of magma from the 1538 eruption of Monte Nuovo (Phlegrean Fields, Italy): An experimental study. *Chemical Geology,* 256(3-4), 158-171. https://doi.org/10.1016/j.chemgeo.2008.06.035

[7] Di Vito, M., Lirer, L., Mastrolorenzo, G. *et al.* (1987). The 1538 Monte Nuovo eruption (Campi Flegrei, Italy). *Bull Volcanol* 49, 608-615. https://doi.org/10.1007/BF01079966

[8] Acocella V, (2008). Activating and reactivating pairs of nested collapses during caldera forming eruptions: Campi Flegrei (Italy). *Geophys Res Lett* 35: L17304. https://doi.org/10.1029/2008GL035078

[9] Pappalardo L, Piochi M, D'Antonio M, Civetta L, Petrini R, (2002). Evidence for multi-stage magmatic evolution during the past 60 ka at Campi Flegrei (Italy) deduced from Sr, Nd and Pb isotope data. *J Petrol* 43: 1415-1434. https://doi.org/10.1093/petrology/43.8.1415

[10] Hans-Ulrich Schmincke, Cornelia Park, Eduard Harms, (1999). Evolution and environmental impacts of the eruption of Laacher See Volcano (Germany) 12,900 a BP. *Quaternary International,* 61(1), 61-72. https://doi.org/10.1016/S1040-6182(99)00017-8

[11] Birks, H.J.B., Lotter, A.F. (1994). The impact of the Laacher See Volcano (11 000 yr B.P.) on terrestrial vegetation and diatoms. *J Paleolimnol* 11, 313-322. https://doi.org/10.1007/BF00677991

[12] Michael Baales, Olaf Jöris, Martin Street, Felix Bittmann, Bernhard Weninger, Julian Wiethold, (2002). Impact of the Late Glacial Eruption of the Laacher See Volcano, Central Rhineland, Germany. *Quaternary Research,* 58(3), 273-288. https://doi.org/10.1006/qres.2002.2379

[13] Wilson C..J.N., B.F. Houghton, M.O. McWilliams, M.A. Lanphere, S.D. Weaver, R.M. Briggs, (1995). Volcanic and structural evolution of Taupo Volcanic Zone, New Zealand: a review. *Journal of Volcanology and Geothermal Research*, 68(1-3), 1-28. https://doi.org/10.1016/0377-0273(95)00006-G

[14] Cole, J.W. (1990). Structural control and origin of volcanism in the Taupo volcanic zone, New Zealand. *Bull Volcanol* 52, 445-459. https://doi.org/10.1007/BF00268925

[15] Houghton, B.F., Latter, J.H. & Hackett, W.R. (1987). Volcanic hazard assessment for Ruapehu composite volcano, taupo volcanic zone, New Zealand. *Bull Volcanol* 49, 737-751. https://doi.org/10.1007/BF01079825

[16] William I. Rose, Craig A. Chesner, (1990). Worldwide dispersal of ash and gases from earth's largest known eruption: Toba, Sumatra, 75 ka. *Palaeogeography, Palaeoclimatology, Palaeoecology,* 89(3), 269-275. https://doi.org/10.1016/0031-0182(90)90068-I

[17] Aldiss, D. T., and S. A. Ghazali (1984). The regional geology and evolution of the Toba volcano-tectonic depression, Indonesia, *J. Geol. Soc.* 141(3), 487-500. https://doi.org/10.1144/gsjgs.141.3.048

[18] Rose, W. I., and C. A. Chesner (1987). Dispersal of ash in the great Toba eruption, 75 ka, *Geology*, 15, 913-917. https://doi.org/10.1130/0091-7613(1987)15<913:DOAITG>2.0.CO;2

[19] Jacob B Lowenstern, Robert B Smith, David P Hill, (2006). Monitoring super-volcanoes: geophysical and geochemical signals at Yellowstone and other large caldera systems. *Philos Trans A Math Phys Eng Sci* 364 (1845), 2055-2072. https://doi.org/10.1098/rsta.2006.1813

[20] Wicks, C., Thatcher, W., Dzurisin, D. *et al.* (2006). Uplift, thermal unrest and magma intrusion at Yellowstone caldera. *Nature* 440, 72-75. https://doi.org/10.1038/nature04507

[21] Gansecki C.A., G.A. Mahood, M.O. McWilliams, (1996). 40Ar39Ar geochronology of rhyolites erupted following collapse of the Yellowstone caldera, Yellowstone Plateau volcanic field: implications for crustal contamination. *Earth and Planetary Science Letters,* 142(1-2), 91-107. https://doi.org/10.1016/0012-821X(96)00088-X

[22] Maria Rosaria Senatore, Annamaria Ciarallo, Jean-Daniel Stanley, (2014). Pompeii Damaged by Volcaniclastic Debris Flows Triggered Centuries Prior to the 79 A.D. Vesuvius Eruption. *Geoarchaeology* 29(1), 1-15. https://doi.org/10.1002/gea.21458

[23] Picard, M. D. (2000). Vesuvius. *Journal of Geoscience Education*, 48(4), 533–540. https://doi.org/10.5408/1089-9995-48.4.533

[24] Lucio Lirer, Tullio Pescatore, Basil Booth and George P. L. Walker, (1973). Two Plinian Pumice-Fall Deposits from Somma-Vesuvius, Italy. Geological Society of America Bulletin (1973) 84 (3): 759-772. https://doi.org/10.1130/0016-7606(1973)84<759:TPPDFS>2.0.CO;2

[25] Kilburn, C.R.J., Carlino, S., Danesi, S. *et al.* (2023). Potential for rupture before eruption at Campi Flegrei caldera, Southern Italy. *Commun Earth Environ* 4, 190. https://doi.org/10.1038/s43247-023-00842-1

[26] De Martino, P., Dolce, M., Brandi, G., Scarpato, G., & Tammaro, U. (2021). The Ground Deformation History of the Neapolitan Volcanic Area (Campi Flegrei Caldera, Somma–Vesuvius Volcano, and Ischia Island) from 20 Years of Continuous GPS Observations (2000–2019). *Remote Sensing*, 13(14), 2725. https://doi.org/10.3390/rs13142725