

Preface on the Special Issue “Volcanology, history and archaeology: bringing the world of physical sciences closer to the humanities”

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This Special Issue of *Annals of Geophysics*, entitled: “Volcanology, history and archaeology: bringing the world of physical sciences closer to the humanities”, originates from session (S05), “Volcanology and Archaeology: Bringing the World of Physical Sciences Closer to the Humanities”, of the Rittmann International Conference, which took place in Catania on 20 September 2024 and whose main theme was the history of volcanology and the impact of volcanic activity on human societies.

The thirteen articles collected in this Special Issue reflect the aims and contents of the presentations delivered by some participants in this session of the Rittmann Conference, as well as by other scholars who welcomed the invitation to contribute to this volume.

Among the physical sciences, volcanology is one of the most highly interdisciplinary subjects, bringing together geological, geomorphological, geophysical, historical-literary, archaeological, and socio-economic expertise. These diverse skills are essential for an all-round understanding of volcanic phenomena and their impact on the environment and human settlements. The historical reconstruction and the philosophical analysis of past and present scientific theories allow us to trace the origins and development of scientific and cultural thought, thereby advancing our knowledge of volcanic phenomena. In particular, the study of the relationships between eruptions and human communities, together with the social, economic, and urban consequences, involves all these disciplines as well as others, including, palaeoanthropology, medical sciences, engineering, architecture, and art history.

More often volcanological and archaeological studies take advantage of geophysics and archaeometric techniques for prospecting investigations and material analysis.

This Special Issue brings together scientific and technical papers that stem from the interaction of various disciplines, thereby enhancing our understanding of the connections between volcanism, the environment, and human communities.

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Themes

The thirteen articles that make up this volume are distinctly interdisciplinary in nature. This type of research helps to bridge the gap between disciplines that historically had many links but have recently become separated due to normative and institutional divisions, which often do not reflect the complexity and diversity of the phenomena under investigation.

Vaggelli et al. apply machine-learning techniques to geochemical data and attribute nine obsidian blades from Tūlūl al Baqarat to Nemrut Dağ in southeastern Turkey. These results support the hypothesis of Tigris River trading networks during the 4th millennium BC.

Cariddi et al. integrate geochemical, isotopic, and mineralogical analyses to characterize obsidian from the Breccia Museo deposit at Vivara, demonstrating that combining rapid elemental determinations with precise isotopic measurements is effective for Central Mediterranean provenance discrimination.

Branca et al. combine a multidisciplinary investigation, including GPR surveys, archaeological excavations, and radiocarbon dating (AD 663-775), to reveal buried Late Roman-Byzantine structures at the Nunziatella site on Mount Etna. The findings confirm the historical significance of the area since antiquity.

Scandone and Giacomelli integrate archaeological, historical, and geological data at the Serapeum of Pozzuoli to reconstruct ground deformation in the Campi Flegrei area. This study enables long-term hazard assessment in volcanic regions.

Roberti et al. examine the scientific instruments employed at Mount Etna and show how volcanology developed as an experimental science. The University of Catania's acquisition of scientific instruments catalyzed its institutionalization as an autonomous discipline.

Foresta Martin uses the Obsidian Sieve tool to provide a rapid assessment of the provenance of Central Mediterranean obsidians using major and minor elemental compositions. The Na₂O vs Cl diagram proves to be the most effective for discriminating major Italian sources.

Raimondi investigates Sicily's thermal waters, highlighting their role as liminal spaces where empirical observation, myth, and cult practices converged to shape religious identity in the ancient Mediterranean. Integrated literary, archaeological, and geological analyses reveal their multifaceted cultural and natural significance.

Giacomelli and Scandone, through stratigraphic analysis of Pompeii victims, reveal that syn-eruptive earthquakes, rather than the initial eruption, triggered widespread structural collapse and caused numerous fatalities. The study emphasizes the crucial role of seismicity in the lethal dynamics of the AD 79 Vesuvius eruption.

Tarascio et al. use Ground Penetrating Radar surveys of the orchestra of Catania's Ancient Theatre to reconstruct pre-existing drainage channels and identify a masonry vault. These structures were used in antiquity for groundwater and rainwater drainage.

Lucchi and Tranne provide a volcanological characterization of Lipari eruptions over the last ~50 ka, defining major obsidian sub-sources. Vallone del Gabellotto (8.7-8.4 ka) is identified as the most important source for prehistoric Mediterranean assemblages.

Tardugno et al. identify Roman warehouses, administrative structures, and a unique Nabataean temple through underwater documentation (2021-2023) of the submerged *ripa puteolana*. The research also provides new evidence of relative sea-level changes during the 1st-4th centuries AD.

Marino and Mattia analyse the institutional response to the 1693 Val di Noto earthquake and reveal the contrast between effective official management and the widespread abandonment of affected populations. The disaster accelerated pre-existing processes while creating new socio-spatial vulnerabilities.

Nitti et al. demonstrate how volcanic activity shaped land use patterns and metallurgical practices through excavations at the Mazzola site (Ischia). The study shows that an 8th-century BC Greek settlement was interrupted by the 7th-century BC Punta Chiarito Tephra eruption and reoccupied in the 6th century BC.

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