

Stratigraphy, structure, and volcano-tectonic evolution of Solfatara maar-diatreme (Campi Flegrei, Italy)

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This study focuses on the Solfatara volcano within Campi Flegrei, a volcanic field located on the Tyrrhenian coast of southern Italy. Volcanism at the Campi Flegrei caldera has included phreatic to phreatomagmatic explosions and both magmatic (ranging from small scoria-producing events to those with Plinian columns) and effusive eruptions. These eruptions have formed tuff cones, tuff rings, minor scoria cones, and lava domes. A detailed stratigraphic, structural, and geophysical study of the area indicates that the Solfatara volcano is a maar-diatreme structure previously not recognized within the Campi Flegrei caldera. It is characterized by a crater cut into earlier volcanic deposits, a small rim of ejecta, and a deep structure (down to 2–3 km). This maar-diatreme has allowed the gases and fluids to flow up to the surface over a long time.

A new geological map and cross sections show a complex architecture of different volcano-tectonic features including scoria cones, lavas, cryptodomes, feeder dikes, pipes, ring and regional faults, and explosive craters. Volcanological data were collected with the main aim of characterizing the eruptive activity in a limited sector of the caldera. Fault and fracture analyses, using the scan line methodology, highlight the role of the main structures that accompanied the volcanic evolution within this sector of the Campi Flegrei caldera. To better constrain the subsurface structure of the Solfatara crater, electrical resistivity tomography investigations were integrated with the volcano-tectonic information. All data suggest that the Solfatara area is dominated by a maar-diatreme evolution. Presently, the Solfatara area shows widespread hydrothermal and fumarolic activity that is localized along the major faults. The results allow us to define a particular type of volcanic activity in the recent past, in what is still considered today an area with a higher probability of opening new vents, particularly for possible phreatic activity.