

Spatial and temporal variations in volcanism younger than 4.5 ka in the Campi Flegrei active volcanic field

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The Campi Flegrei caldera is an active volcanic field in one of the most densely populated and high-risk volcanic areas in the world. Volcanological, structural and geochemical research documents an intense volcanism with a series of 15 explosive and effusive eruptions over a 200-300 years period following less than 2 centuries of repose after the Agnano-Monte Spina Plinian eruption (about 4.5 ka). The renewal of volcanism was preceded by an uplift of a few tens of meters, triggered by mafic refilling of reservoirs at depths of 3 km or less. The repose was ended by a sequence of about 15 eruptions, twelve of the events were of low magnitude and involved some combination of phreatomagmatic, strombolian and effusive activity. All but one of the eruptions occurred in the eastern-central part of Campi Flegrei, which coincided with the area of maximum deformation and seismic and hydrothermal energy release inside the caldera.

The activity began with the SMG explosive event which erupted latites and include a sequence of ash surge layers beneath a strombolian scoria fallout deposit that formed a small scoria cone with a feeder conduit exposed south of the Solfatara crater. Subsequently close to SMG scoria cone growth the Olibano lava dome which was overlain by a sequence of volcanic breccias and fine-ashes generated by phreatic explosions from the southeastern corner of the present Solfatara crater. Later a lava dome forming eruption laid down several layers of scoria breccias at the base of the Accademia lava dome which shortly preceded the vulcanian activity of the Solfatara maar. The SMG, Olibano, Accademia and Solfatara eruptions were clustered along NW-SE-trending faults at the boundary of the minor Agnano Monte Spina caldera. Similar trending faults were also activated during the seven eruptions of Astroni followed by the Fossa Lupara event which was erupted from a vent along the same NW-SE eruptive fissure as Astroni. The exception to the clustering was the Averno event, in the western sector of the caldera, located along an old NNW-SSE structure, outlined by several eruptive centres active from ca. 14 to ca. 4 ka. Tephra from the Averno eruption was deposited while Solfatara was still active and provides the first direct evidence that concurrent explosive activity has occurred in two different sectors of the caldera.

The presented data show that eruptions may cluster at intervals of a few years to decades and also occurred simultaneously in the eastern and western sectors of the caldera, providing insight into future eruption scenarios in CF for hazard-mitigation plans.