



Evaluating fracture patterns within a resurgent caldera: Campi Flegrei, Italy

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Understanding deformation of active calderas allows their dynamics to be defined and their hazard mitigated. The Campi Flegrei resurgent caldera (Italy) is one of the most active and hazardous volcanoes in the world, characterized by post-collapse resurgence, eruptions, ground deformation and seismicity. An original structural analysis provides an overview of the main fracture zones. NW-SE and NE-SW fractures (normal or transtensive faults and extensional fractures) predominate along the rim and within the caldera, suggesting a regional control, both during and after the collapses. While the NE-SW fractures are ubiquitous in the deposits of the last 37 ka, NW-SE fractures predominate in the last 4.5 ka, during resurgence. The most recently (<4.5 ka) strained area lies in the caldera centre (Solfatara area), where the faults, with an overall ENE-WSW extension direction, seem associated with the bending due to resurgence. Solfatara lies immediately to the east of the most uplifted part of the caldera (Pozzuoli area), where domes form and culminate both on the long-term (resurgence, accompanied by volcanic activity) and short-term deformation (1982-1984 bradyseism, accompanied by seismic and hydrothermal activity). Here a consistent volcano-tectonic behaviour characterizes the short- and long-term uplifts, and only the intensity of the tectonic and volcanic activity varies, being related to varying amounts of uplift. Seismicity and hydrothermal manifestations occur during the bradyseisms, with moderate uplift, while surface faulting and eruptions occur during resurgence, with higher uplift. The features observed at Campi Flegrei are found at other major calderas, suggesting a consistent behaviour of large magmatic systems.