Geophysical Research Abstracts
Vol. 16, EGU2014-5776, 2014
EGU General Assembly 2014

A combined morphostructural/fluid migration model of Pisciarelli area (Campi Flegrei caldera - CFc) through structural and integrated Terrestrial Laser Scanner (TLS) and Electrical Resistivity Tomography (ERT) analysis.

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The Solfatara-Pisciarelli (S-P) area was characterized by an intense eruptive activity during the last 5 ka and is presently the highly distributed degassing zones inside the CFC, worldwide well-known for its bradyseismic phenomenon. The last two main crises occurred during the 1970-72 and 1982-84, associated with an overall 3.5 m of ground uplift and an elevate rate of low magnitude seismicity. A strong direct relationship has always been observed between the increase of hydrothermal activity in the S-P area and ground uplift of the CFc. More recently starting from the 2005 a new gradual increase of the hydrothermal activity and ground uplift has been observed, with a steep growth of these effects from 2012, accompanied by seismic events with highest magnitude of 1.8. The Pisciarelli area has been the site of a significant morphological changes of its hydrothermal field including new fumarolic vents and a wide enlargement of a mud pool.
Monitoring either landscape deformation than fluids migration of the S-P activity can be considered a good indicator of the volcanic dynamics taking place in the whole CFc caldera.
This study shows a first attempt to integrate multidisciplinary approach including volcanological and structural field surveys and studies such us TLS and ERT signals applied to this highly dynamic areas.
A detailed geo-structural survey allow us to characterize the complex pattern of fractures and faults recorded in the volcanic rocks in different times of the polyphasic CFc volcanic history. In order to statistically record data about fault and fracture (i) attitudes and (ii) spacing, the scan line method was applied. The whole planar structure is the locus of the well-known fumaroles and mud pools of Pisciarelli.
A first time detailed Digital Terrestrial Model DTM of the area with an accuracy of 5cm obtained through TLS has been integrated combining the ERT of the lower part of the area, characterized by a widespread fumarolic activity and soil diffuse degassing, mainly in
correspondence to fractures and faults.
The TLS analysis of the area was performed applying the technique based on Time of Flight method in order to define an accurate 3D digital model for detailed analysis of this area. Several scans were performed in order to avoid shaded areas due to the presence of either fumaroles than soil degassing. The dense vapour emission in the area, in fact limits the ability of penetration of the laser scanner.
Electrical measurements has been acquired to reconstruct the spatial distribution of the electrical resistivity, which is a physical parameter particularly sensitive to the presence of low-resistivity phases, such as aqueous fluids and partial melts. In such a way, the volume of subsurface fluids has been constrained and the rheology of the subsoil in the Pisciarelli area has been reconstructed.
Combining all the data a structural and geomorphological model of the area has been obtained. Similar dataset could be acquired in the future in order to estimate any structural changes that may occur in this interesting volcanic area therefore providing a better hazard assessment.