Significance of the 1982–2014 Campi Flegrei seismicity

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What ==>> We relocated the last 30 years of seismicity at Campi Flegrei seismicity using the Double-Difference technique (Waldhauser and Ellsworth, 2000) and the 1D velocity model, modified after Vanorio et al., (2005).

Why ==>> The aim of this work is to explain the occurred seismicity in light of the hydrothermal processe and faulting, drawing attention to the importance of preexisting tectonic features at regional scale.

Results

1. The DD-relocated seismicity between 1982 and 2014 is associated with pressure variations in the hydrothermal system, which preferentially reactivates preexisting volcano-tectonic or tectonic structures, and favors fracture-controlled pathways for the migration of fluids toward the surface.

2. The hypocentral distribution of the seismicity highlights an outward dipping fault in the western sector of Pozzuoli bay

3. The distribution of the DD seismicity does not match the subcircular uplift deformation pattern centered in Pozzuoli town, but it is concentrated within brittle rock volumes affected by preexisting fractures and is a time-dependent function of previous hot fluid injection episodes

4. The focal volume variation in time shows a progressive rheological change within the upper 4 km of the crust, where rock behavior transitions from elastic to plastic. This implies that a slow upward migration of magma may not necessarily be preceded by earthquakes or swarms.



Interpretative model based on the attenuation tomography by

res, and 2015, orange dots.

the map region.

De Siena et al., (2010). hydrothermal basin and gas reservoir H_O-rich high Q

POZ = Pozzuoli; Poz bay = Pozzuoli bay; SP = Solfatara-Pisciarelli; LS = La Starza Black stars mark the location of the main decassing areas. Green dashed lines indicate the alignments deduced from the DD-relocations, whereas the red dashed lines are the main fault traces from



The October 2015 events (orange dots) are located at the intersection between the NW-SE striking Pisciarelli fault (red line) and the NE-SW cracks (blue lines) where the Pisciarelli present-day gas discharge occurrs (star). Therefore, these events testify the re-activation of pre-existing fracture systems, which are preferential pathways for the migration of hydrothermal fluids towards the surface. According to Bianco et al. (2004), a fluid pressure of about 30 MPa at 3 km depth is required to re-activate the cracks.







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14°09

dashed blue line indicates La Starza terrace. The dashed black square indicates the study area The bold red line indicates the Pisciarelli fault. Orange dots are the seismic events occurred in October 2015



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fault trace crack

500 m



14°12