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Rheological profile of the crust along the transect Phlegrean Fields – Mt.Vesuvius – southern Apennine chain (Italy)

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We compared the brittle–ductile transition depth of the widely accepted strength profile model of the crust along the W-E transect Phlegrean Fields – Vesuvio – Southern Apennine chain with cutoff depth of seismicity.The brittle–ductile ratio depends on the geothermal gradient, strain rate and tectonic context. High geothermal gradients produce ascent of the ductile layer and the development of plastic instabilities, promoting the partial melting of rocks and occurrence of volcanic phenomena.

We determined the temperature profile from 10 borehole measurements, and the thermal conductivity and heat production were also measured by taking numerous core samples.

The thermal field obtained allows us to define the rheological stratification model along the transect, which shows that the brittle-ductile transition is located at 3 - 4 km below the Phlegrean Fields area, it descends at about 8 km of depth underneath Vesuvian area and deepens up to 15 km beneath Southern Apennine. In particular in the Vesuvian area the top of the ductile layer along the volcanic crater axis up rises till to 5 km depth, corresponding to the lower boundary of seismogenetic volume. Such analysis suggests that the driving forces of volcanic activity could be associated to uprising of a ductile layer which connects the upper mantle to the volcanic feeding system, unlike previous works which associate the source of the volcanic activity to a closed magma chamber confined in the shallow crust.

The thickness of the seismogenetic layer and consequent regional variations in the

cutoff depth of seismicity is closely related to the strength of the crust. Also we constrained the rheological section of the area with the seismicity, by relocating events with M$\geq$2.5. This shows that all earthquakes are located in the upper crust ($\leq$ 15 km).