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Rheology and seismicity at Mt. Vesuvius

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The aim of this paper is to investigate the rheological properties of the crust beneath Mt.Vesuvius and to understand the driving process of the local seismicity. In order to define the thermal state of the crust, a conductive stationary model with a source formed by two co–axial cylinders coinciding with the crater axis has been utilized. The thermal field model shows that the 350 – 400˚C isotherm corresponds to the lower boundary of seismogenetic volume at 4 km depth beneath the crater axis, in good agreement with experimental studies which identify at these temperatures the limiting values for the occurrence of seismicity. Such thermal field allows us to obtain the rheological stratification of the crust beneath volcano; the model 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.

Finally in order to understand the mechanism of generation of local seismicity a model of stress field acting on the rocks has been performed. This shows that the lithostatic compression of the crust together with the overpressure due to the loading of volcanic edifice is able to exceed the frictional strength of the crust until a depth of 3 - 4 km and to generate the observed seismicity.