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Definition of Brittle Ductile Transition of the upper crust beneath the Campi Flegrei-Ischia Volcanic District and its impact on natural seismicity

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The thermo-rheology behaviour of the rocks is a crucial aspect to understand the mechanical behaviour of the crust of tectonically active area. As a consequence, several studies have been performed since last decades in order to clarify the role of thermic state in the evolution of volcanic areas. In this framework, the knowledge of the Brittle-Ductile transition inside the upper crust may provide insights to verify the roles that some hypothesized mechanisms, such as slab pull, crustal delamination might have played in the evolution of a tectonically active region. The goal of our study was the 3D imaging of the crust rheology beneath the active Campi Flegrei-Ischia Volcanic District and its impact on natural seismicity. Despite many works have been done on the internal structure of the active volcanoes, the determination of the 3D rheological stratification of the crust below the caldera has not yet been tackled. To fill this gap of knowledge, we proposed the definition of 3D geometry of the Brittle-Ductile transition calculated via numerical optimization modelling based on geological, geochemical, and geophysical available data. We first performed a 3D numerical modelling of thermal field by using the a priori geological and geophysical information starting to thermal proprieties and mechanical heterogeneities of the crust beneath the caldera. We developed a suitable 3D conductive/convective time-dependent thermal numerical model solving the Fourier equation and further we used the retrieved thermal model to image a 3D rheological stratification of the shallow crust below the volcanic district. Finally we demonstrate the role of the crustal rheology on seismicity cut off and its implication on maximum expected earthquakes magnitude.