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Structural imaging of the Pernicana Fault System through the joint use of electrical and magnetotelluric investigation

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Mount Etna lies on the footwall of a large normal fault system. Flank instability and displacement of the eastern to southern flanks are some of the most debated questions among the researchers, that from several years are involved in the study and understanding of these phenomena. Even if there is a good agreement on the surface features that constrain the instable sector (identification of the structures and their kinematics), the 3D extent of sliding area is still under debate. In this context the Pernicana Fault System (PFS) characterization plays a crucial role for the understanding of the style and the extent of the spreading of eastern portion of Etna. Infact, the Etnean mobile eastern sector is bordered, to the north, by the E–W-trending PFS, with a left lateral-normal motion. In order to define the basal decollement of the eastern Etnean sector, large scale (MT) and small scale (DC) methods were used, covering different spatial ranges in resolution. Three different survey profiles, perpendicular to PFS and almost parallel to each other, were performed. MT dimensionality analysis shows that a 2D model can be reasonably assumed at least until 20 s, while the presence of a complex structure, mainly 3-D, should be considered for the longer periods. Moreover, at shallower depths the PFS is the structural feature that determines the electrical strike angle, while, at deeper depths, the recovered angle seems to be compatible with re-

gional scale features such as the NE Rift. Inversion results, of the three investigated profile, well define three resistivity main layers. A shallow resistive layer (thousands ohm.m) that may be related volcanic cover, reaching its major thickness towards the south in each section and decreasing from west to east. A conductive intermediate layer that may be related to volcanic sedimentary substratum, with higher conductivity values in correspondance of the fault. Its thickness is greater in the unstable sector within major thickness are assumed towards the south. A resistive bedrock which can be associated with the Maghrebian Chain. The recovered depth of the horizon between the conductive zone and the resistive bedrock surprisingly matches with the location of earthquake ipocenters recovered by seismic studies. This horizon probably represents the basal decollement of the mobile sector within the Pernicana Fault System.