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Combined magnetotelluric and petrologic constrains for the nature of the magma storage system beneath the Ciomadul volcano (SE Carpathians)

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The Ciomadul volcano is the youngest in the Carpathian-Pannonian region (eastern-central Europe) and there are indications that magma could still reside at the depth. Therefore, we performed a magnetotelluric investigation with the aim to detect a still hot magma reservoir. The results were compared with those coming from the petrological investigations. The Ciomadul volcanic complex contains a central amalgamated set of lava domes and a few peripheral domes with two explosion craters in the central zone. Geologically the domes were built by effusion of high viscosity dacite magma. Lava dome collapses resulted in volcanoclastic deposits (block-and ash flow deposits). The magmatic activity could have been connected to the seismically powerful region of the nearby Vrancea zone.

Twelve long period magnetotelluric (MT) soundings were carried out to aim of define to electric resistivity distribution of the volcanic system and find correlation with the petrologic model to confirm the hot magma chamber beneath the region. At each MT site, the horizontal components of the magnetic and the electric fields were observed between the 0.00006-4 Hz frequency range. The vertical component of the magnetic field was also recorded to analyze the lateral conductivity inhomogenities under the subsurface. Soundings were located in non systematic grid and we selected several profiles which may represent the resistivity distribution of subsurface and cross-sections were applied as well.

At started by dimensionality analysis and decomposition parameters the most part of the measuring are multi-dimensional. Traditional MT interpretation - 1D, 2D inversion and modeling - was carried out taking into account the decomposition results. 3D interpretation is not realized because of weak resolution of the data and large memory requirement. Both the local 1D inversion and the 2D inversion along the profiles defined a low resistivity zones at about 2 km depth which in continuation at depth with a deeper and wide extensive conductive anomaly (15-30 km). Its lateral distribution and depth changes can be indicate any melting process in the volcano. The shallower anomaly can be correlated with altered and clayey volcanic materials or groundwater storage. The deeper low resistive layers can be connected to the melt storage or magma volumes which were not emptied during the last eruption. This depth range is consistent with our petrological investigation suggesting a dacitic magma reservoir at 6-14 km depth, whereas another, basaltic magma storage zone could be at the lower crustal depth (25-30 km)

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