Three-dimensional Magnetotelluric Crustal Model of High Agri Valley seismic area to identify and to quantify the resistivity variation in depth

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The High Agri Valley (HAV) is an axial zone of the Southern Apennines thrust belt chain with a strong seismogenic potential as shown by different stress indicators and space geodesy data that suggest an NE-SW extensional stress regime still active. Moreover, the HAV hosts the Europe’s largest onshore oil and gas field, which give it further strategic importance.

There is a certain ambiguity concerning the causative fault of the large event (M=7.0) occurred in 1857 in Agri Valley, although two well-documented fault systems are recognised as potentially seismogenic: the Monti della Maddalena Fault System (MMFS) and the Eastern Agri Fault System (EAFS).

With the aim to bring new information on identification and characterization of the principal structures, on the fluids distribution and their possible relationship with the developed of kinematics in upper fragile crust, several multiscale and multidisciplinary surveys are currently running in the HAV. Here we present the first results of a 3D Magnetotelluric (MT) investigation composed of 58 MT soundings in the period range $[10^{-2}$ Hz, $10^3$ Hz] which cover an area of approximately of 15 km x 30 km. All the 3D results were obtained by using the 3D inversion code ModEM: Modular EM Inversion Software.

The work carried out so far has been mainly focused on the definition of the best mesh to adopt, both in terms of cell size and orientation, and on the correct choice of the inversion parameters: resistivity of the starting model, smoothing model parameter, minimum error floor attributed to the data, regularization parameter (trade-off).

The 3D MT preliminary model obtained shows a good agreement with 2D models previously realized using parts of the same dataset and defines the main geo-structural features of the HAV. The resistivity variations in HAV subsurface will be jointly interpreted with accurate seismic data.
collected by seismic broadband network INSIEME (composed by 8 stations distributed throughout the Agri Valley) and other available geophysical and geological data.

The interconnection between the conductivity and seismicity information will be useful to implement the knowledge on the role that fluids play in fault zones and in earthquake processes.