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Electromagnetic methods for investigating tectonically active areas in Southern Apennines chain (Italy)

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Southern Apennines chain (Italy) represents one of the most seismically active areas of the central-western Mediterranean region, as testified by the frequent and strong earthquakes that have struck this area, both in historical and recent times. Although Southern Apennines are characterized by strong crustal earthquakes, local active tectonics is still poorly known, at least for seismogenic fault-recognition is concerned. The difficulty in identifying active faults is mainly due to the deep structural complexity of the inherited fold-and-thrust belt chain and to the high erodability of the siliciclastic units that form the superficial structure of the seismogenic belt, which don't allow the preservation of short-term, low-rate (<1 mm/yr) tectonic indicators. Additional difficulties derive from landforms that have the same appearance but a different genesis, as in the cases of geomorphological convergence. Accordingly, the nature of the morphological features could remains uncertain, if solely based on superficial investigations, like geomorphologic mapping.
Taking into account the complex seismotectonic scenario of the Southern Apennines, a multi-scale interdisciplinary approach can be a powerful and necessary tool in investigating recent tectonic structures. In particular, in this work complementary investigation methods, including active and passive geophysical electromagnetic techniques, such as Ground Penetrating Radar (GPR), Electrical Resistivity Tomography (ERT) and Magnetotellurics (MT), coupled with detailed geological mapping, were applied in the Ufita and Agri valleys, two intermontane basins located in the seismically active axial sector of the Southern Apennines. These studies allowed to resolve problems still unexplained by previous geological suerveys, such as the deep geometry of the seismogenic basins, the exact position of active faults and their geometrical characterization. Moreover, high resolution geophysical techniques (especially 2D ERT) proved to be effective in verifying the nature of morphological features previously mapped and interpreted as tectonic indicators.