

## **Multidimensional electrical resistivity survey for bedrock detection at the Rieti Plain (Central Italy)**

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### **Abstract**

The combined use of 1D, 2D and 3D electrical resistivity methods for estimating bedrock depth is presented with an application to a case study located in Central Italy. The site is a narrow basin where two boreholes were drilled reaching the bedrock, which had the greatest depth in the center of the basin. Six vertical electrical soundings were executed along a basin cross-section in order to have a preliminary 1D reconstruction of the bedrock and the overlying alluvial deposits. Inverted resistivity models, show bedrock depths in accordance with the borehole data and a complex subsurface layering of the overburden deposits to be further investigated with 2D and 3D electrical resistivity tomography. Four additional electrical lines, acquired using a pole-dipole array and directed normally to the alignment of the vertical soundings, confirm the 1D results in regards to the bedrock depths, adding additional information about the continuity of the bedrock within the basin, and giving a high-resolution image of the shallower sediments. Through the tomographic inversion of 3D data, we were able to reconstruct a volumetric image of the carbonate formation at the study site. Finally, the tomographic models have been validated through the inversion of a synthetic dataset, with the aim to attain a final model, whose synthetic model is comparable with the field one. The final model, estimated using an iterative procedure that minimizes the absolute difference between field and synthetic models, has retrieved a bedrock resistivity one order of magnitude higher than that obtained from field data inversion

**Keyword:** Electrical resistivity tomography, Inversion, Model appraisal, Rieti Plain



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