Comparative Study of Effectiveness of Selected Resistivity Arrays in Conducting 2D and 3D Electrical Resistivity Surveys over a Known Void Located in Clayey Soil

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ABSTRACT

The SuperSting R8 resistivity meter, produced by Advanced Geosciences Inc., was used to conduct a comparative electrical resistivity surveying (ERS) over a known subsurface void to assess the effectiveness of each resistivity method. The survey was conducted over alluvium soil from the Weches clay formation, located at the southwestern corner of the intramural field at Stephen F. Austin State University. Both 2D and 3D resistivity methods were used to conduct this study. 2D survey methodologies utilized five different arrays (Dipole-Dipole, Wenner, Pole-Dipole, Schlumberger, and Pole-Pole), along a 56 meter survey line with 1 meter electrode spacing. 3D survey methodologies utilized three different arrays (Radial Dipole-Dipole, Mixed Dipole-Gradient and Gradient) conducted at the same study site, over an 8X14 meter grid with 1 meter electrode spacing. Resistivity data was inverted using the EarthImager 2D and 3D software to produce true resistivity profiles of the subsurface of the study area. Each array employed a different method of collecting resistivity data and; therefore, produced slightly different images of the subsurface. Resulting resistivity sections were compared with the known subsurface structure and composition to determine the most suitable and accurate method for determining the subsurface structure.

Past comparative electrical resistivity studies have investigated the effectiveness of various combinations of electrical resistivity arrays but none have utilized this unique combination of both 3D and 2D electrical resistivity methods. The results of this study will provide a reference guide for geoscientists interested in conducting similar experiments.

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