



Two collateral problems in the framework of ground-penetrating radar data inversion: influence of the emitted waveform outline and radargram comparison.

Rui Jorge Oliveira (1), Bento Caldeira (1,2), José Fernando Borges (1,2)

(1) University of Évora, Institute of Earth Sciences, Évora, Portugal (ruio@uevora.pt), (2) University of Évora, Physics Department, Évora, Portugal

Obtain three-dimensional models of the physical properties of buried structures in the subsurface by inversion of GPR data is an appeal to Archaeology and a challenge to Geophysics. Along the research of solutions to resolve this issue stand out two major problems that need to be solved: 1) Establishment the basis of the computation that allows assign numerically in the synthetic radargrams, the physical conditions at which the GPR wave were generated; and 2) automatic comparison of the computed synthetic radargrams with the correspondent observed ones.

The influence of the pulse shape in GPR data processing was a studied topic. The pulse outline emitted by GPR antennas was experimentally acquired and this information has been used in the deconvolution operation, carried out by iterative process, similarly the approach used in seismology to obtain the receiver functions.

In order to establish the comparison between real and synthetic radargrams, were tested automatic image adjustment algorithms, which search the best fit between two radargramas and quantify their differences through the calculation of Normalized Root Mean Square Deviation (NRMSD). After the implementation of the last tests, the NRMSD between the synthetic and real data is about 19% (initially it was 29%). These procedures are essential to be able to perform an inversion of GPR data obtained in the field.

Acknowledgment: This work is co-funded by the European Union through the European Regional Development Fund, included in the COMPETE 2020 (Operational Program Competitiveness and Internationalization) through the ICT project (UID/GEO/04683/2013) with the reference POCI-01-0145-FEDER-007690.