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Combination of GPR with other NDT techniques in different fields of application - COST Action TU1208

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During the last decades, there has been a continuous increase in the use of non-destructive testing (NDT) applied to many aspects related to civil engineering and other fields such as geology or sedimentology, archaeology and either monument or cultural heritage. This is principally due to the fact that most NDT methods work remotely, that is, without direct contact, while adding information of non-visible areas. Particularly, geophysics has significantly benefited the procedures for inspection and also, successfully solved some of the limitations of traditional methods such as a lack of objectiveness, destructive testing, loss of safety during infrastructure inspection, and also, low rates of production.
The different geophysical methodologies are based on the measurement of physical properties of media. However, all geophysical methods are sensitive to different physical parameters and the success of these methods is related to the nature of the buried features themselves, in terms of their physical and geometric properties, soil conditions, operational factors such as the sensitivity of equipment and etc. Consequently, taking into account all of these factors, to obtain reliable and complementary results, multiple geophysical methods rather than single method and moreover data integration approaches are recommended to provide accurate interpretations.

This work presents some examples of combination of Ground-Penetrating Radar (GPR) with other NDT techniques in different fields of application (pavements/railways, archaeological sites, monuments, and stratigraphy in beaches and bathymetries). An example of combination of GPR and Falling Weight Deflectometer (FWD) to assess the bearing capacity of flexible pavement is described as the most efficient structural evaluation of pavements and one of the most commonly applications of the methods on civil engineering inspections. Results of archaeogeophysical field surveys in Turkey are also included by combining the most common geophysical methods used for archaeological prospection (GPR and magnetometry). Regarding cultural heritage, an example in Barcelona (Spain) of the assessment of masonry structural elements, with embedded metallic targets, is included. Seismic tomography and 3D GPR imaging are applied, both supported with endoscopy. The results highlight the most affected areas of the structure and the existence of corroded metallic elements as consequence of humidity. Finally, two case studies support the importance of combining data in geological applications. Firstly, GPR and Electrical Resistivity Tomography (ERT) were combined for the analysis of the littoral drift and the tidal range affecting the transport of sediments in costal environments, and more particularly in O Adro Beach, in Vigo (Spain) that had been subjected to extension activities during the last decades. Secondly, the combination Multibeam Sonar and GPR data is presented for the study of a lake, which is an abandoned kaolin mine. Thus, it was possible to analyze the column of water in all the extension of the lake, while differentiating layers of lacustrine deposits and kaolin rock formations in subsurface.

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