Geophysical Research Abstracts
Vol. 12, EGU2010-5972, 2010
EGU General Assembly 2010

First geophysical results on Musmeci Bridge next to Potenza city (Basilicata Region, South of Italy) in the framework of ISTIMES project

Massimo Bavusi (1), Francesco Soldovieri (2), Felice Carlo Ponzo (3), Antonio Loperte (1), Monica Proto (1), and Vincenzo Lapenna (1)

(1) CNR-IMAA, Tito Scalo (PZ), Italy (bavusi@imaa.cnr.it, +39 0971 427302; loperte@imaa.cnr.it; proto@imaa.cnr.it;lapenna@imaa.cnr.it), (2) CNR-IREA, Napoli, Italy (soldovieri.f@irea.cnr.it), (3) Università degli Studi della Basilicata - DiSGG, Potenza, Italy (felice.ponzo@unibas.it)

This paper shows the preliminary results coming from the Ground Penetrating Radar (GPR) surveys and data processing based on MT carried out on the Musmeci Bridge, in Potenza City (Basilicata, Italy), an important example of architectonic culture of the XX built in the 1968 by the Italian architect Sergio Musmeci. The bridge, at present day, suffers several aging related problems worse by the traffic growth of the last ten years.
Ground Penetrating Radar (GPR) technique is now an effective tool for non invasive diagnostic of reinforced concrete. However, the achievement of the full spatial resolution requires to perform long sessions of data processing affected by a level of the operator's subjectiveness increasing as long as the investigated scenario becomes complicated. This drawback can be mitigated by advanced data processing based on microwave-tomography (MT) which faces an inverse scattering problem (Leone and Soldovieri, 2003). In particular, the adoption of the a simplified model of the electromagnetic scattering as the Born Approximation (BA) makes it possible to tackle the realistic cases of large domains in a reasonable amount of time and via an automatic procedure.
Previous studies aimed at characterizing the structure of the Musmeci bridge, have considered the coupling of the Georadar technique with the classic Pacometric investigations for the detection of the reinforcement bars and their spatial position. Main limitation related to both techniques consists in detecting only the shallowest embedded rebars. The preliminary results of this study show that the GPR associated to the MT inversion allow to provide very high spatial resolution data, to detect the embedded rebars deeper and deeper and to overcome the subjectiveness of the operator. Moreover, the MT algorithm allows to process a large amount of data in a short time.
The bridge is one of the test-sites selected within the ISTIMES "Integrated System for Transport Infrastructure surveillance and Monitoring by Electromagnetic Sensing" project, which has been approved in the 7th Framework Programme. The overall purpose of the project is to design, assess and promote an ICT-based system, exploiting distributed and local sensors, for non-destructive electromagnetic monitoring in order to achieve the critical transport infrastructures more reliable and safe. The activities performed in this paper are part of the System implementation working programme of the project, aimed to demonstrate the effectiveness of the overall monitoring ISTIMES system (ICT expert system plus electromagnetic sensing techniques) at the test-site identified by the end-users involved in the proposal.
At Musmeci bridge, the best available technologies for electromagnetic structure diagnosis and new ICT protocols for remote control of sensor network and near-real time processing will be exploited for the implementation of a completely new monitoring system.

References

G. Leone, F. Soldovieri, "Analysis of the distorted Born approximation for subsurface reconstruction: truncation and uncertainties effect", IEEE Trans. Geoscience and Remote Sensing, vol. 41, no. 1, pp. 66-74, Jan. 2003.

Acknowledgment

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under Grant Agreement n° 225663 **Joint Call FP7-ICT-SEC-2007-1