CLOUD PLATFORM AND SMART UNDERGROUND IMAGING FOR NATURAL RISK ASSESSMENT IN URBAN AREAS: THE CLARA PROJECT

V. Lapennna for the CLARA partners
Istituto di Metodologie per l’Analisi Ambientale del CNR (IMAA-CNR), Tito, Italy

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The project proposes a novel systemic approach for the characterization of the physical and geometrical properties of the surface and near-surface in urban areas located in seismic active zones and/or interested by hydrogeological instability phenomena. The approach is based on the full integration of satellite remote sensing (optical and radar technologies), geophysical exploration technologies (seismic tomography, electromagnetic tomography, resistivity and self-potential tomography, etc.), advanced sensors (fiber optic sensors, low-cost accelerometers, MEMS, etc.) and ICT architecture (web-services, web-sensors, google-like services etc..) for the development of an open, scalable and interoperable cloud platform for the sharing, visualization and management of geospatial data in urban areas.

To-date, there is a growing demand of innovative products and services for the management of activities to be implemented in urban subsurface environments (Showstack, 2014 and reference therein). The mitigation of the effects of natural and man-made geohazards (earthquakes, landslides, collapses and sinkholes, etc.), the realization and monitoring of strategic infrastructures (energy pipelines, road and railway network, etc.) and the exploitation of the natural resources (groundwater, geothermal fluids, etc..) are strategic priorities in any approach of urban planning and strongly require a complete geological/geophysical characterization of subsurface.

This project responds to this demand by integrating the latest enabling technologies (remote sensing and ground-based, active and passive; direct and indirect; multi-sources and multi-resolution;) for the geophysical exploration of the surface, the near-surface and the dynamic characterization of soil structure/infrastructures interactions. The proposed system is based on the integration of remote sensing (satellite remote sensing) and non-invasive technologies suitable for 2D and 3D geophysical imaging of the subsurface in an urban environment, in which there is generally an intrinsic difficulty to work with direct surveys and invasive drilling. (Giocoli et al., 2014; Giocoli et al., 2011; Piscitelli et al., 2007; Stabile et al., 2013).

The project identifies three main urban case-studies: the city of Ferrara; the Province of Enna and the city of Matera. Recently, Matera with its historical center of the Sassi UNESCO World Heritage Site has been appointed as European Capital of Culture 2019. In this work we focused our attention to the role of the electromagnetic sensing technologies and measurements for
mapping active faults, sinkholes, voids etc. in complex urban environments: a critical review of results obtained in many urban areas of Italy is presented. Finally, the first preliminary results of a geophysical field survey carried in the historical center of Matera will be illustrated and discussed.

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References


