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Geophysical monitoring of engineering infrastructure foundations

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The geophysical methodologies can give for providing useful information about the subsoil, environment, buildings, and civil infrastructures and supporting the public administrations in planning interventions in urban scenarios. In the past years, the geophysical prospection methods have been improved for the inspection of foundation soils, civil structure, and engineering infrastructures. Anyway, the potential of geophysical techniques in urban sites is mainly known in characterisation contexts, while a monitoring use has not yet been developed. Therefore, new applications and laboratory experiments are needed to enhance their capability and development.

This work introduces a time lapse three-dimensional Electrical Resistivity Tomography (3D ERT) monitoring on the effects of the standard practice of shallow polyurethane resin injected below the settled foundations of a villa. The application was performed to monitor the effectiveness of the consolidation beneath the building with time. The 3D ERT was applied before and after the injection phase. The geoelectrical acquisitions were performed with electrodes arranged close the external walls with an electrode space of about 1m. Therefore, non-conventional setting of the electrode layout was adopted permitting to obtain a 3D model of the geophysical parameter distribution close the foundations. The time-lapse 3D ERT highlighted the effects of the resin injections. In addition, an experiment was carried out in the laboratory through the creation of a physical model of a foundation placed in a sandbox in which the conditions of resin injection after a subsidence are simulated.