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Applied urban geophysics for monitoring engineering structures: real cases and lab experiments

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The role of the applied geophysics for the new scenario of the global urbanization is going to be important. In fact, a high-resolution observation point of the shallow geological subsoil and its iteration with the urban infrastructures became a fundamental point of view. The reinforced concrete (RC) technologies has become the most used technology into the engineering infrastructures. However, RC technology is affected by degradation phenomena that could reduce strongly the life time of engineering structures. This weakness is due to corrosion for flow of chloride ions, cracks, fractures or delamination induced by mechanical stresses, voids or carbonation due to water or moisture coming from the subsoil. Therefore, it is important to develop a new approach less invasive and with fast detection that taking in account not only the structure but also the “infrastructural critical zone” in order to considers the interactions between geology and foundations and the static and dynamic aspects of structures and infrastructures. A novel sub-discipline, called Urban Geophysics, has recently been developing in the field of geophysics for analyzing limits and potentialities of well-known geophysical techniques in urban and industrialized areas. Unfortunately, not all the geophysical techniques are applicable in urban areas for the strong noise due to the presence of metallic structures. However, good results are achievable with applications of electrical resistivity measurements and ground penetrating radar so much to investigate structural elements as to monitor the stability of civil structures. The work presents an experimental approach on full-scale engineering structures and some real cases where the electrical resistivity technique and ground penetrating radar were jointly applied for civil engineering issues.