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Near surface geotechnical and geophysical data cross validated for site characterization applications. The cases of selected accelerometric stations in Crete island (Greece)

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The near surface ground conditions are highly important for the design of civil constructions. These conditions determine primarily the ability of the foundation formations to bear loads, the stress – strain relations and the corresponding deformations, as well as the soil amplification and corresponding peak ground motion in case of dynamic loading. The static and dynamic geotechnical parameters as well as the ground-type/soil-category can be determined by combining geotechnical and geophysical methods, such as engineering geological surface mapping, geotechnical drilling, in situ and laboratory testing and geophysical investigations.
The above mentioned methods were combined for the site characterization in selected sites of the Hellenic Accelerometric Network (HAN) in the area of Crete Island. The combination of the geotechnical and geophysical methods in thirteen (13) sites provided sufficient information about their limitations, setting up the minimum tests requirements in relation to the type of the geological formations.
The reduced accuracy of the surface mapping in urban sites, the uncertainties introduced by the geophysical survey in sites with complex geology and the 1-D data provided by the geotechnical drills are some of the causes affecting the right order and the quantity of the necessary investigation methods.
Through this study the gradual improvement on the accuracy of the site characterization data in regards to the applied investigation techniques is presented by providing characteristic examples from the total number of thirteen sites.
As an example of the gradual improvement of the knowledge about the ground conditions the case of AGN1 strong motion station, located at Agios Nikolaos city (Eastern Crete), is briefly presented. According to the medium scale geological map of IGME the station was supposed to be founded over limestone. The detailed geological mapping reveled that a few meters of loose alluvial deposits occupy the area, expected to lay over the Neogene marly formations and the Mesozoic limestone, identified at the surrounding area. This changes the ground type to E instead of A, based on the EC8 classification. According the geophysical survey the Neogene formations extend down several meters and the mean Vs30 is 476m/s, increasing the rank of the ground type to B. Finally, the geotechnical drill reviled that the loose alluvial deposits extend down 13m containing two clearly identified layers of liquefiable loose sand. Below the alluvial deposits a thin layer (1,5m thick) of Neogene marly formations and the karstified limestone was located, as expected. So finally it was proved that the ground type category at the site is S2, setting up the geotechnical drills as the determinant investigation technique for this site.
Besides the above described case, all selected examples present sufficiently the ability, the limitations and the right order of the investigation methods aiming to the site characterization.
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