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ASSESSMENT OF SITE EFFECTS AND SOIL-STRUCTURE RESONANCE IN ALGIERS CENTER

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The damage pattern in urban areas during an earthquake depends on the characteristics of the event and on the interaction between site response and vulnerability of the exposed structures (Gosar, 2012). Shear wave velocity Vs is one of the most important input parameter to characterize the dynamic properties of soil. Several geotechnical and geophysical methods are developed for estimates directly or indirectly the parameter Vs. The microtremor horizontal-to-vertical spectral ratio (HVSR) method has been widely used for site effect studies (Ohmachi et al., 1991; Field and Jacob, 1995; Bard, 1998). The application of microtremor measurements has been extended to identify the fundamental frequencies of buildings (Goar, 2010).

The results of site response using microtremor measurements compared with geological and boreholes data for Algiers center is one the main objective of this research work.

The horizontal to vertical spectral ratio (HVSR) technique has been applied in order to assess the fundamental frequencies of the soil, beside the transversal and longitudinal frequencies of each selected building are also identified, in order to detect the potential risk of soil structure resonance.

The geology of the study zone, Algiers region located Figure 1, is represented by metamorphic rocks surrounded by Mio-Plio Quaternary sedimentary deposits (Saadallah, 1981).

Nearly 33 geotechnical boreholes have been drilled to different depths in the region study. The resonance frequency (H/V) values calculated using the Nakamura technique seismograph instruments recorded on 24 sites (Figure 1).

In SPT test case, the soil identification is based on soil sampling, and the blow count N-value is obtained. Many correlations between Vs and penetration resistance have been developed for different soils.

The investigations carried out during the realization of the subway gives the range (5-60) of N_{SPT} values for 12 m of depth means that the soil is hard to very hard near the surface (GMAC,1984). The corresponding fundamentally frequency is in the range 15-45 Hz, that confirmed the observation, in some places rock outcrop is also visual identified. At the periphery of the layout subway, the borehole details were collected to a depth of about 30 m (JICA, 2006). The results show that the values frequencies are closed between the range 0.2 - 16 Hz.

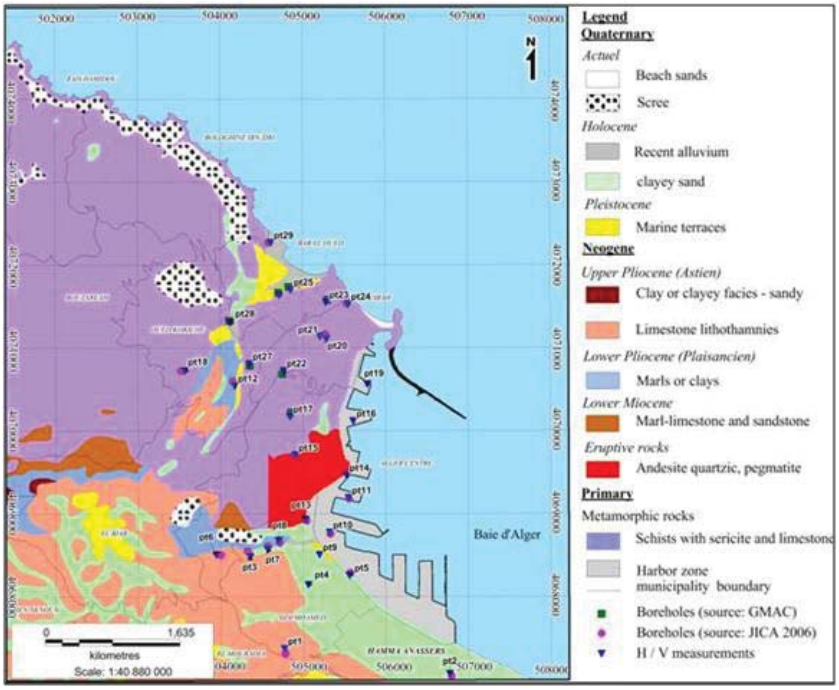

Figure 1. Spatial distribution of boreholes and geophysical H/V measurements.

The frequency of the selected buildings derived from FSR method is between 1 and 6 Hz at the tow both directions. We observe that the frequency difference between both directions is usually small which indicates the similar rigidity of construction systems.

The geophysical mapping of the study site by an SPT investigation limited to 12 m for the central zone of the study area and up to 30 m for the peripheral part shows a good correlation of results. The HVSR investigation at 30 m SPT points shows an excellent correlation between the results.

The study site exhibits a frequency in the range 0.2 - 16 Hz. The characterization of the existing representative buildings, located on the study site resulted in fundamental frequency values in the range 1- 6 Hz. Therefore, we can observe that some buildings are exposed to the phenomenon of resonance.

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