



MICROTREMOR SOIL-STRUCTURE RESONANCE STUDY IN FIVE SLOVENIAN TOWNS LOCATED IN SHALLOW SEDIMENTARY BASINS

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Site effects studies using microtremor free-field measurements were performed recently in five Slovenian towns characterized by increased seismic hazard to determine resonance frequency of soft sediments. In this study microtremor investigations were extended to the measurements inside masonry buildings to determine their fundamental frequencies and to assess the possible occurrence of soil-structure resonance. Measurements were performed in 66 buildings and by spectral analysis it was possible to determine reliably fundamental frequencies (longitudinal and transverse) for 58 buildings. Residential masonry houses with two or three-floors prevail, but some buildings of up to six-floors height were also surveyed.

Microtremor measurements have proved to be an effective tool for assessment of fundamental frequencies of buildings. Such experimental approach is very valuable, as analytical seismic evaluation of an existing building is usually very difficult. Statistical analysis of the fundamental frequency vs. number of floors (height) was performed to generalize identification of potential soil-structure resonance. The difference in average fundamental frequency is very clear between buildings with two and three floors. The average value of both horizontal components for two-floor buildings is 9.11 ± 1.94 Hz and for three-floor buildings 7.03 ± 1.46 Hz. On the other hand the difference in frequencies between three- and four-floor buildings (average for later is 6.52 ± 0.80 Hz) is very small. The average fundamental frequencies for five- and six-floor buildings are lower, 4.62 ± 0.64 Hz and 5.30 ± 0.70 Hz respectively, with no statistically significant difference between both types.

Most Slovenian towns are located in shallow sedimentary basins where the free-field soft covers frequencies are in the range 2–20 Hz. On the other hand masonry houses with two and three floors represent the large majority of the building stock. To assess the possible occurrence of soil-structure resonance in general, an average fundamental frequency \pm one standard deviation interval is obtained for these two building heights, which gives the range 5.6–11.1 Hz. The free-field data shows that this frequency range occupies from 22% of the surveyed area in the Kobarid basin to up to 59% in the Bovec basin and is in-between for other three basins (Ilirska Bistrica, Litija and Brežice). This leads to the conclusion that the possible occurrence of soil-structure resonance is a serious issue for typical geological situations, in which Slovenian towns are located.

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