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# Application of active and noise-based site characterization methods during seismic microzonation of Budapest, Hungary

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Seismicity around Budapest is moderate but somewhat higher than the average in Hungary. The largest well known historical earthquake (M5.6) occurred in 1956 in the vicinity of Dunaharaszti, 5-10 km distance from the southern boundary of the capital. The quake caused damages in Budapest that were surveyed in detail after the event. Studying the damage distribution, some areas of more severe-than-average damages could be observed. The geological structure of Budapest is very complex which potentially has a great impact on damage distribution. On the right bank of the Danube, older Triassic and Miocene rocks form the Buda Hills while on the left bank Holocene and Pleistocene sediments cover the area.
Seismic microzonation of the city is in progress now. Our future objective is to give inputs for engineering design and seismic risk computations. Therefore we have studied the applicability of different methods that could be used for microzonation purposes. The test sites were selected based on the geological conditions and the damage distribution of the 1956 Dunaharaszti earthquake.
We have carried out active (MASW) and passive (ReMi, ESAC) seismic measurements to determine the S wave velocities of upper sedimentary layers. Where the field conditions allowed, we have applied all of the aforementioned methods and compared the results given by them. In every test site we have carried out HVSR measurements too and performed joint inversion of surface wave dispersion and HVSR curves.
We have studied the local applicability of ambient noise correlation method (seismic interferometry), because of its numerous advantages. It can be carried out without an active source and using only two seismometers, which can be placed even on streets in urban areas. The method uses the cross correlation of two, simultaneously recorded seismograms to infer the impulse response of the medium between the two receivers. The cross correlation function is used to generate dispersion curve, which can be inverted for S wave velocities. During our measurements, station distances varied between 50 m and 500 m, thus information could be obtained from the uppermost few tens of meters. The resulted velocity model can supplement the model determined by MASW and ESAC measurements in larger depths.