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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Study on the applicability of microtremor HVSR method to support seismic microzonation in the town of Idrija (W Slovenia)" *by* Andrej Gosar

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Response to Referee #1 comments

Comm.: The geological section requires more geological and stratigraphic details, I suggest to add the geological cross section and details about lithological units.

Response: More details on the lithological units of alluvial sediments, which are relevant for seismic site amplification, were added to the last paragraph of the Introduction. No detailed cross-section of these sediments from drilling or geophysical investigations is available to be included, this is explained in the text. This fact was one of the main motivation for presented microtremors study, because only in this way resonance fre-

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quencies could be obtained without detailed knowledge on sediments thickness and S-velocity structure. Additional explanation on this was added to the text.

Comm.: I believe that the resonance peaks at f0>12 Hz should not be considered for the estimation of the iso-frequency map because they are attributable at so thin soil layers (1-2m) not influent for site condition.

Response: I prepared a map taking into account only resonance peaks with f0<12 Hz. However, the result was not satisfactory, because we cannot consider HVSR curves with higher peak frequencies (f0>12 Hz) as a flat response although they are above the engineering interest. Some very clear peaks were obtained at higher frequencies (for example Id37 and Id54 in Fig. 5). Omitting these points from contouring resulted in values in the map (at this points) obtained by interpolation, which are far from measured and thus wrong. This can lead to erroneous assessment of potential soil-structure resonance at particular location.

Comm.: The presence of peaks at so close and narrow frequencies (e.g. Id24, Id6, Id13 etc..) are not attributable to a multilayer setting above the bedrock, because probably some are spurious spikes. The shapes of these spikes are more visible in the Fourier spectra, I suggest to analyse the ambient noise measures using a triangular window with 10% smoothing.

Response: A discussion on the nature of several peaks was added to the text. For Id6 and Id24 the influence of multilayer setting is now explained only as additional factor which can have impact on the shape of HVSR curve, because both measurements are located in an area where both artificial deposits and alluvial sediments are expected. For Id13 it is explained as spurious peak which has no influence on determination of a resonance frequency. All measurements were analysed as Fourier spectra (one example is shown in Fig. 3) and as HVSR with different level of smoothing, including 10% smoothing. Additional explanation on this was added to the text.

Comm.: I suggest to group the measures according the same lito-stratigraphic con-

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dition so as to highlight if the geological condition induces a similar site amplification behaviour. It is unclear how two measurements performed on the same geological unit have HVSR functions completely different, for example the Id20 measure close to Id25 one are on the same alluvial sediment but the HVSR shapes are completely different.

Response: Text was improved to highlight how similar geological conditions induces a similar site amplification behaviour. However, it is clearly described that site amplification cannot be simply correlated to the surface geology, due to very heterogeneous geotechnical properties of artificial and alluvial deposits. Unknown shallow subsurface structure (S-velocity and density distribution) was the main motivation for a study based on microtremors which does not require a-priori knowledge on it to derive resonance frequency. Additional explanation was added to the text to highlight this facts. Measurement Id20 is located on artificial and deposits (shown in Figs. 1 and 2) which are reflected in a clear HVSR peak. On the other hand measurement Id25 is located on a bedrock (this is visible in Figs. 1 and 2) which is reflected in a flat HVSR response.

Comm.: Include the orientation of the map shown in Fig. 1b, Fig. 2, Fig. 8 and Fig. 9. In the iso-frequency map I suggest to contour better the areas, the south and east areas have no data then the frequency interpolations are wrong.

Response: The orientation mark (North arrow) was added to all maps as suggested. The iso-frequency map (Fig. 8) was contoured in a better way to consider missing data.

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