H/V and H&V:  probably the fastest way to map the bedrock?

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Abstract

The microtremor Horizontal-to-Vertical Spectral ratio (HVSR or simply H/V) technique is a well-known geophysical method, expected to provide the resonance frequencies of soft sedimentary layers overlying stiffer layers. A few minutes recording of ambient microtremors by means of a tri-axial seismometer are enough to show characteristic spectral patterns, varying from site to site, according to the local geological features.
From the resonance equation $f =\frac{V}{4H}$, it can be seen that the resonance frequency ($f$) of a layer is inversely proportional to its thickness ($H$) and that when one knows or can assume a ‘characteristic’ seismic wave propagation velocity ($V$) for the sedimentary layer, the resonance frequencies can be converted into thicknesses of resonating layers, thus allowing to image the ground.

We show a number of notable examples of bedrock and other seismic reflectors mapping performed by means of sequencies of short H/V recordings collected in 2D or 3D configurations. We will show the effect of the assumptions on the seismic wave propagation velocity ($V$) and we will state the benefits and the limitations of the technique and specifically the cases when it cannot be applied, and what one should do in those cases.

The hope is that the presented approach will be used by the geological community for expedite subsoil imaging at different scale, with a clearer idea of its benefits and limitations.

Keywords: HVSR, soil resonance, seismic stratigraphy, microtremor