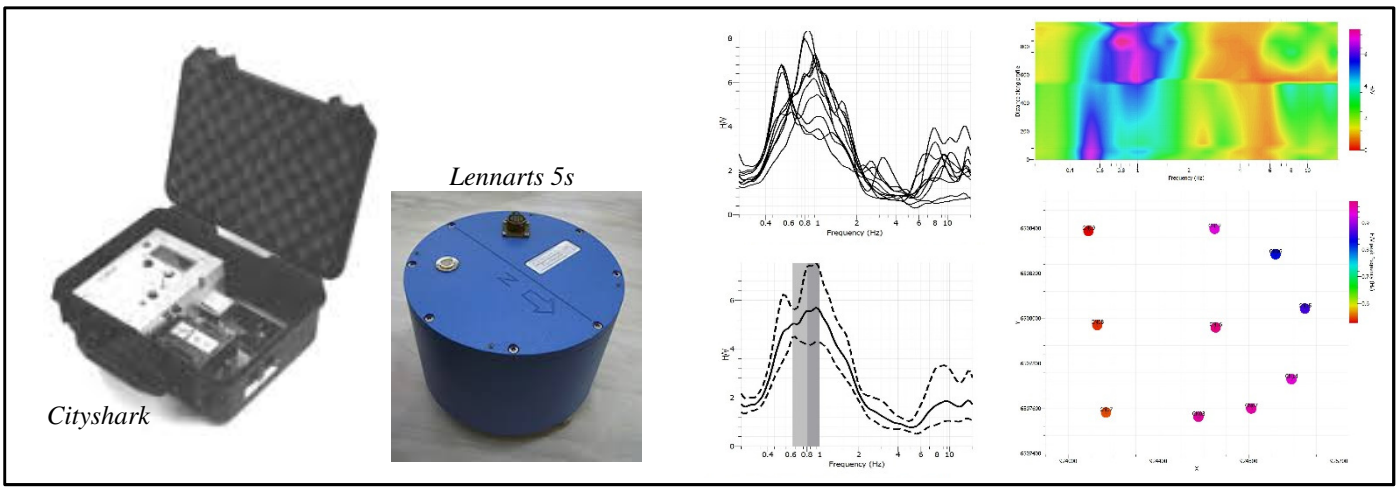
H/V



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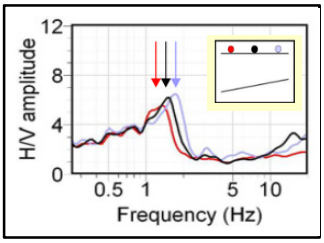

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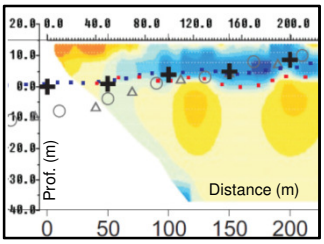

3

The H/V method is a non-destructive method used to map the resonance frequency of the subsurface, itself linked to the mechanical properties of the different soils and rocks present in the ground.

Applications

- Design of structures
- Seismic risk
- Geological, depth of bedrock

Wave propagation laws show that the ground amplifies horizontal vibrations at certain frequencies, with respect to vertical vibrations. The amplification frequency is calculated by taking the ratio of the spectra of the horizontal (H) and vertical (V) components.

In a situation with a soft ground layer on top of a stiff bedrock, the amplification frequency corresponds to the resonant frequency of the sub-soil, which depends on the mechanical parameters and on its thickness. The deeper the stiff bedrock layer OR the softer the sediments, the lower the resonant frequency.

A low frequency 3-component seismic sensor is placed directly on the ground (where possible half-buried for better coupling and to protect it from its environment). Ambient vibrations are recorded over a period of 15 to 30 minutes per point. The operation is repeated for each measurement point.

The amplification frequencies calculated at each point can be directly mapped. They can be used in the design of structures which, for example, should not have the same natural frequency as the ground in order to avoid resonance in seismic events.

In simple geological settings, the map of the depth to bedrock can be estimated from the map of the amplification frequencies calculated, if one of the following is known:
- the value of the velocity of the shear waves over the whole of the sedimentary layer (determined by method MASW or AVA for example), or
- the depth to the top of the bedrock in a few points (from borehole data for example).

Legend
1. Data acquisition and processing
2. H/V graph for sloping bedrock
3. Measurements of the depth to bedrock using H/V method (crosses), gravimetry (triangles) and electrical tomography (couleurs)

Key figures
- 15 to 30 mins per point
- Can be used in stratified zones
- Possible depth of investigation linked to frequency of sensor used

SDG Equipment
- Low frequency seismic sensor, 3-components
- High definition scanner
- GPS antenna