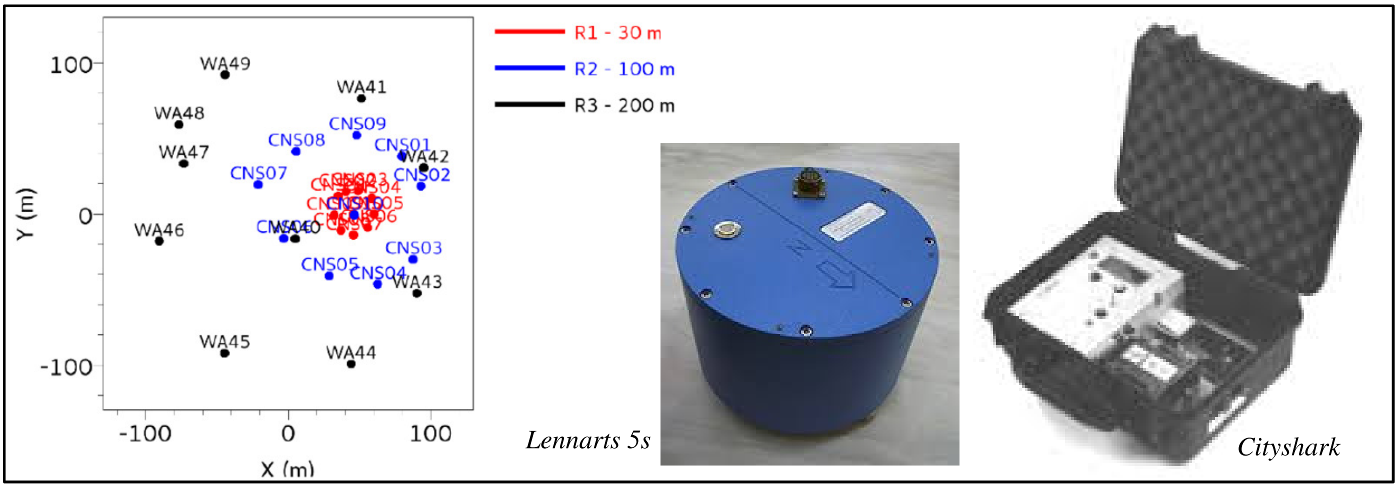
SOLDATA GEOPHYSIC

AMBIENT VIBRATION ARRAY (AVA)



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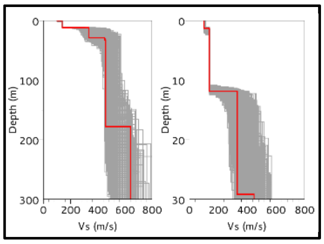

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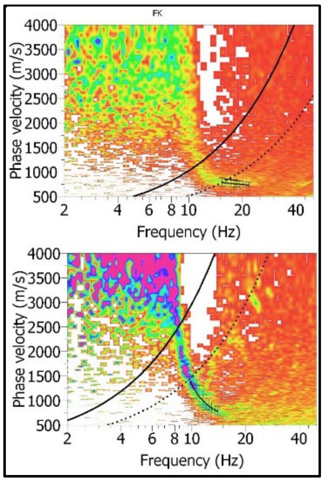

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Ambient vibration array (AVA) is a non-destructive seismic method for assessing the velocity of shear waves (Vs), which is linked to the shear modulus (G).

Applications

- Seismic risk: estimating the vertical profile of Vs, calculating Vs30, soil class determination.

This method analyses the dispersion of surface waves, that is to say the variation in their propagation velocity as a function of their frequency of vibration. This is directly related to the change of Vs with depth, which can thus be estimated by inversion.

Eight or more seismic sensors are installed at the ground surface around the measuring point and record the seismic vibrations for up to several hours. Depending on the desired depth of penetration, several concentric pseudo-circles are made successively so as to investigate the subsoil, from the near surface (small networks) up to greater depths (large networks). The choice of sensor is also determined by the desired depth of penetration: for small depths (for example, calculation of Vs30), 4.5 Hz vertical sensors will be sufficient; to investigate beyond tens of meters, low-frequency sensors are required.

Data processing is performed using the software Geopsy (ISTerre Grenoble). Depending on the type of study, one or more calculation techniques can be used together to obtain a reliable dispersion curve associated with a measurement uncertainty in the frequency range corresponding to the desired depth of penetration.

At the end of the study the following are provided:

- a set of velocity profiles Vs(z), which explain the dispersion curves observed with their standard deviation
- the velocity profile that best explains the observed average dispersion curve
- the distribution of Vs30 calculated for each model of the set
- the average Vs30 and associated standard deviation.

agap QUALITÉ GÉOPHYSIQUE APPLIQUÉE

ISO 9001 BUREAU VERITAS Certification

Legend

1. Example array layout and microtremor recordings
2. Velocity models Vs(z) giving data with standard deviation (grey) and 'best' model (red)
3. Histograms obtained with different network apertures

Key figures

- 8 to 15 stations per network
- 10 to 1000 m aperture
- 30 to 800 m investigation depth (a function of the aperture and the geology of the site)

SDG Equipment

- 8 to 15 low frequency seismic sensors, preferably 3 components
- 1 seismic station per sensor
- WiFi antennas
- GPS antennas
- Batteries