

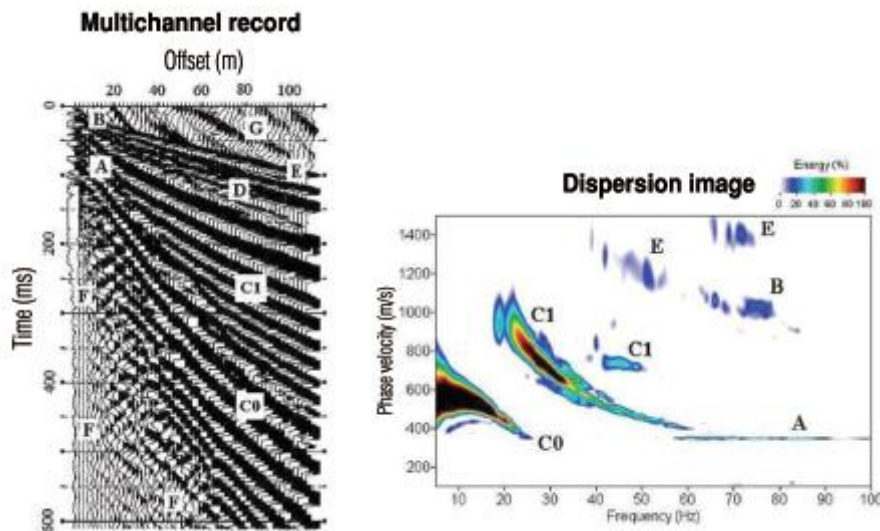
## GENERAL DISCRPTION

The multichannel analysis of surface waves (MASW) method tries to utilize the dispersion property of surface waves for the purpose of VS profiling in 1D (depth) or 2D (depth and surface location) format. Basically it is an engineering seismic method dealing with frequencies in a few to a few tens of Hz (e.g., 3-30 Hz) recorded by using a multichannel (8 or more channels) recording system and a receiver array deployed over a few to a few hundred meters of distance (e.g., 2-200 m).

Near-surface geophysical surveys such as MASW are gaining popularity throughout the world due to the fact that they are non evasive, easy to perform and accurate. These surveys produce knowledge of sub surface structure, thickness of layers, velocities of body waves, and soil amplification parameters like Vs30.

### Multichannel Analysis of Surface Waves (MASW) - Theory

MASW tests use the dispersive properties of surface waves. Dispersion is the phenomenon in which the phase and group velocities of a surface wave depends on frequency. In a layered media, the frequency of a surface wave is related to the elastic and physical properties of the material (Lee et al., 2002). Geophones used in MASW surveys record a wave train formed by waves of different frequencies arriving at different times. Amplitudes recorded are a function of all frequencies generated within the layered media. Since surface waves are generated as a result of P and Vs (vertical shear-wave) waves interfering, once the appropriate dispersion curve is picked from the multichannel shot record of the propagating surface waves, it is then inverted to obtain the P and Vs wave velocities as a function of depth (Wathelet, 2005).

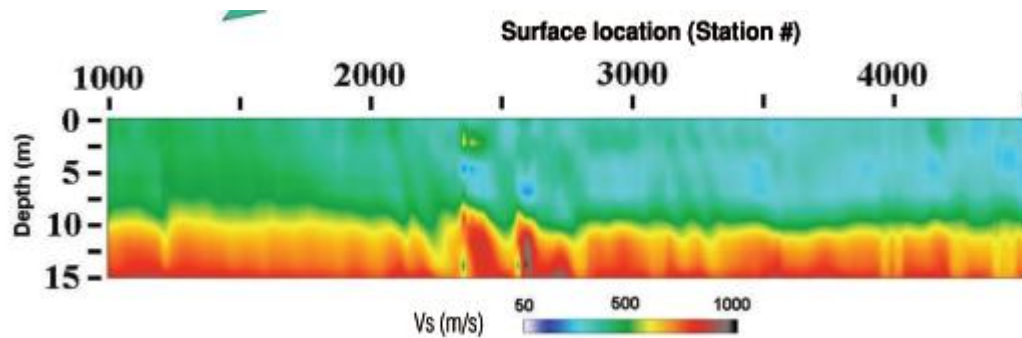


The dispersion curve is an interpretation of the different modes or harmonics of the surface wave as it propagates through a given media. The Vs30 parameter is calculated by taking a weighted average

of the Vs wave velocities calculated for inversion within the first 30 meters. Vs30 is given by the equation:

$$V_{S_{30}} = \frac{30}{\sum_{i=1,N} \frac{h_i}{V_i}}$$

Where  $h_i$  is the depth and  $V_i$  is the velocity at that respected depth



#### Field survey

Usually the field survey consists 8 vertical geophones positioned linearly and spaced 2 up to 5 meters apart (figure 1). The seismic source for the MASW surveys is a 5 kilograms hammer which strikes on a metal shock plate. For the MASW survey, shots are initiated from just one direction end of the line and the vertical component of Rayleigh waves is recorded. Shots are initiated at 2 and 4 meters from the nearest geophone. Array techniques for MASW are based off the F-K method and dispersion curves are inverted using GEOPSY software.