SENSITIVITY ANALYSIS FOR THE ELLIPTICITY OF RAYLEIGH WAVES

Saeed SOLTANI
M.Sc. Student of Geophysics, IIEES, Tehran, Iran
s.soltani@iiees.ac.ir

Ebrahim HAGHSHENAS
Assistant Professor, IIEES, Tehran, Iran
haghshen@iiees.ac.ir

Mohsen FAZLAVI
PhD Candidate, IIEES, Tehran, Iran
m.fazlavi@iiees.ac.ir

Hossein HAMZELOO
Associate Professor IIEES, Tehran, Iran
hhamzehloo@iiees.ac.ir

Keywords: Sensitivity Analysis, HVTFA Method, RayDec Method, Arak City, Wavelet Parameter

In 3 recent decades, many researchers shown that the classic H/V spectral ratios from a single-station ambient noise recording, can be used to retrieve the Vs profile of alluvial deposits, based on the relation of the H/V curves and the ellipticity of the fundamental mode of Rayleigh waves that has a tight dependency to the shear-wave velocity variation of underground soil profile.

Comparison of the H/V peaks of ambient noise and site/reference method on earthquake data in the framework of European SESAME project (2004) showed a good agreement of H/V peaks with resonance frequency of the site. More extensive studies in recent years showed that omitting of the body and love waves in H/V calculation can give a good estimation of Rayleigh wave's ellipticity which provides us well data for Vs profile estimation, in addition to determination of site resonance frequency.

Two methods of time-frequency analysis (Poggi and Fah, 2010) and random decrement method (Hobiger, 2009) have been introduced in this regard. In each of these methods the H/V spectral ratio is calculated by phase shifting of horizontal component in $\pm \pi/2$, and in this way only the participation of Rayleigh waves in H/V ration can be determined. After extracting the Rayleigh wave's Ellipticity, the velocity profile of site can be obtained by inversion of reliable part of these curve (right flank of the H/V peak).

The present paper shows the result of sensitivity analysis for 6 sites in city of Arak in center of Iran. These stations have been installed for 2 months in March and April of 2014 in the framework of seismic microzonation of the city.

The most important conditions that their effects on Ellipticity were tested are:

1-The thermal effects (Figure 1); in summer data, there is not enough energy of Rayleigh waves, below the resonance frequency, to retrieve the left flank of the low frequency peak.

2-The effect of human activities; comparison of day-night periods shows the relatively same trend and there is not significant differences.

3-The effects of energy level, comparing between microtremor records and earthquake events (Figure 2). The results clearly describe the effect of energy level in extracting suitable Ellipticity curves.

4-Time needed for stabilization of the seismometers. The results prove that 30 min. of noise recording is enough for reliable curves (Figure 3).

5- Calculation parameters for HVTFA and RayDec methods such as the wavelet parameters. For the HVTFA the effect of two parameters of morlet (wavelet coefficient) and the number of peaks selected per minute (nppm) were considered and the value of m=1 and n=5 were applied.

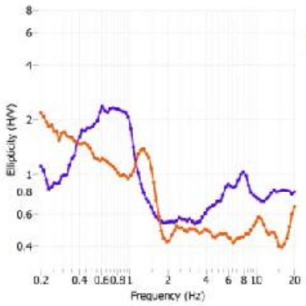

Figure 1. Comparing the results for summer and winter data

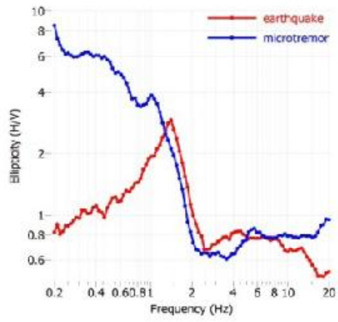

Figure 2. Comparing between earthquake event and ambient noise records

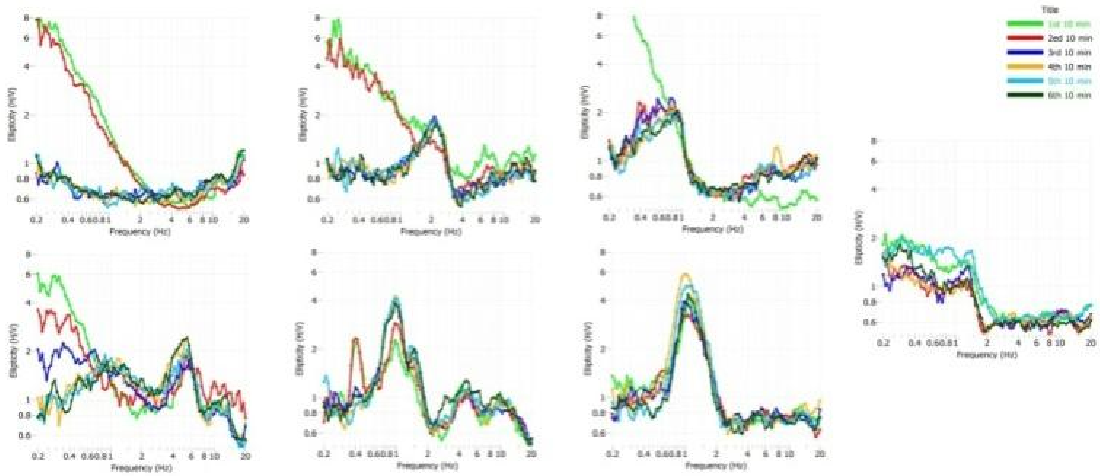

Figure 3. Comparing stability based on time needed for stabilization of the seismometers

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