

Evaluation of the Effects of Impact Angle and Source Type on the Generation of Surface Waves

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As the popularity of the multichannel analysis of surface waves (MASW) method has increased for geophysical and engineering applications, a significant amount of research has examined the effects of testing configuration, particularly for Rayleigh waves derived from vertical impact sources. However, recently there is a growing trend towards the use of Love waves generated from horizontal impacts due to potential improvements in inversion accuracy, stability, and non-uniqueness. The role of testing configuration has seen less development with respect to Love waves. In particular, angled impacts that contain some horizontally- and vertically-polarized input wave energy are routinely used to generate Love waves. This has the added potential benefit that Rayleigh wave energy is also generated and can be measured simultaneously with Love waves assuming sufficient channels are available in the data acquisition system. However, the role of impact angle on Rayleigh and Love wave signal quality has not been systematically examined. Moreover, there are a number of source base plate designs that have been utilized to couple these impacts with the ground to generate Love waves. The effects of source type on Love wave generation have also seen little development in the literature. In this study, field waveforms with different Love wave sources and impact angles were acquired and compared with respect to dispersion quality, spectral content, and signal to noise ratio. The results indicated that Love waves had less sensitivity to the angle of impact. In fact, a non-trivial amount of Love wave energy was also still generated from purely vertical impacts. In contrast, Rayleigh wave dispersion behavior was more affected by impact angle, with more vertical impacts generating more power but exciting higher modes.

Suggested Topic(s): 1.02 – Multichannel Analysis of Surface Waves (MASW) and Passive Seismic

Key Word(s): Surface Waves, Rayleigh, Love, Source, Impact Angle