

The Ellipticity of Rayleigh Waves and Non-destructive Testing

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Abstract. Acoustic surface waves and especially Rayleigh waves are well suited for testing material surfaces and superficial changes of materials in the broadest sense. It is well-known that Rayleigh waves have vector character with longitudinal and transversal components. The ratio of horizontal to vertical components (H/V), the so-called ellipticity, is an indicator for the elastic parameters of the uppermost layers of the material. In seismology, the H/V-method is very important and popular for the determination of site conditions in assessing the seismic hazard. Recently, the ellipticity of Rayleigh waves was used for the determination of certain elastic parameters in material science. We demonstrate theoretically and experimentally that the frequency content of the ellipticity of Rayleigh waves can be used for the characterization of superficial layers in non-destructive testing analogously to the H/V-method in seismology.

For this purpose it is necessary to use transducers which are sensitive to all three components of the surface-wave motion.