Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01116, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01116
EGU General Assembly 2008

Imaging near-surface heterogeneities: surface wave scattering and inversion by Born approximation

A. Kaslilar

Istanbul Technical University, Turkey (kaslilar@itu.edu.tr/+902122856201)

Near surface heterogeneities cause scattered body and surface waves. This study particularly focuses on scattered surface waves. Surface waves are widely used in global, exploration and engineering seismology. The difference in applications is the frequency content and the array aperture of the measurements which affect the investigation depth. Due to their wavelength content, the surface waves do not require dense sampling when compared to body waves and therefore they are more economic. On the other hand their depth penetration is limited due to their exponential decay with depth, however they are suitable for near surface studies. To image the near surface heterogeneities an efficient inverse scattering method is developed by using the Born approximation. Three dimensional elastodynamic wave propagation and scattering is considered in a laterally invariant layered embedding medium. By using linearity, the total wavefield is represented as the sum of the incident and scattered wavefields. The Greens tensors, required for the calculation of the wavefields, are obtained in an efficient way by considering the radial symmetry of the medium. Only the mass density contrast, being the difference between the scattering and embedding densities, is considered. The conjugate gradient iterative inversion method is used to estimate the size, location and the actual density contrast of the scatterer. The method has been verified by numerical tests and by an ultrasonic data obtained from a scale model experiment. The scattered surface waves are used to image the location, depth and the actual density contrast of the scatterers. The method is applied to a seismic field data collected over a tunnel and reasonable results are obtained. The current study under progress includes adapting the method for passive seismic data where irregular source and receiver geometries will take place. The aim is to image the heterogeneities near to the

surface in large scale.