Geophysical Research Abstracts, Vol. 7, 05531, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05531

Monitoring crustal condition variations using Coda Wave Interferometry technique

D. Pandolfi, C. J. Bean (1), K. S. Vogfjord (2)

(1) Seismology & Computational Rock Physics Lab, Geophysics Group, Geology Dept. University College Dublin, Dublin, Ireland, (2) Icelandic Meteorological Office, Physics Department, Reykjavik, Iceland

The Coda Wave Interferometry (CWI) Technique (Snieder et al 2002) extracts information contained in the tail of seismograms by using doublets (i.e. two events recorded at the same station at different times, with high coherency waveforms). Changes associated with stress redistribution, fluid movement or temperature changes can be subtle, and the use of later coda arrivals, dominated by multiply scattered waves, enhance our ability to detect these changes, due to longer path length. CWI technique is able to detect and discriminate between velocity variations in the medium, source location displacements and 'average scatterer displacement' using correlated waveforms recorded by a single receiver. CWI is based on path summation, wherein the signal is decomposed into a sum over all scattering path changes and all possible mode conversions. Cross correlation reaches its maximum at a time that is given by the mean travel time change over all paths. This mean is weighted by the energy of each arrival in the path summation. The obtained Correlation Coefficient and the Correlation Lag-Time are mathematically related to the variance and the mean travel time perturbation. The mean variation is computed only by cross correlation using the scattering medium as an interferometer. First we demonstrate the reliability and range of applicability of the technique by applying it to synthetic seismograms. Then we apply the method in different regions such as the South Iceland Seismic Zone (SISZ), the Vesuvius area and the central Apennines during the aftershock sequence in 1997. For a correct application of the technique using natural sources, it is compulsory to employ doublets, so we used cross correlation analysis to identify the doublets and we visually check each pair. In order to avoid artefacts associated with instrument response, we filtered data in the instrumental linear response window. We will show results from the three dif-

ferent regions, representing different characteristics of medium and different temporal window but all representing tectonic data. Although the work is still ongoing, initial results point to velocity variations observed in a 7 year time window associated with the two 2000 June 17 and 21 M>6.0 earthquakes in SISZ, where the bigger velocity magnitude variation is observed west of the 21th June 2000 earthquake fault. In the Italian regions we observe also scatterers movement, which we were not able to detect in the Icelandic data, as source-receiver distance is too big. Source displacement is generally observed for all the different regions over small temporal periods.