S43B-04 - Fault Zone Scattering Properties from Ambient Noise Cross-Correlations

Thursday, 12 December 2019

14:25 - 14:40

Moscone South - 158, Upper Mezz.

Abstract

Intrinsic absorption and scattering properties provide us with information about the heterogeneity of the Earth's crust. These properties are usually obtained by observing the energy decay of naturally occurring earthquakes and/or active shot records.

The present study uses ambient noise cross-correlations to analyse the energy decay and scattering properties over a part of the North Anatolian Fault (NAF; Turkey) from the continuous records of the 72 stations of the DANA temporary array [1] in the frequency band 0.1 - 0.5 Hz. The region covered by the stations has rapidly varying geological characteristics and is highly faulted around the northern strand of the NAF. We measured in the noise correlations the space-time evolution of the energy of the coda waves. We first perform measurements in separate regions. The local scattering and attenuation properties are obtained by global optimisation of a 2D solution of the radiative transfer equation for surface waves. We found that the mean free path and attenuation coefficient are considerably varying with a strong scattering observed in the region lying along the northern strand of NAF.

The optimisation provides well-constrained values for the scattering mean free path (ℓ) of the order of 15km in the fault region. The mean free path is much larger (>100km) in the neighbouring regions. Note that the size of the network is not sufficient to provide a strong constraint of large ℓ . Finally, we compare our global observations with simulations of scattered energy in a laterally variable model of radiative transfer. The optimal heterogeneous model can be used to evaluate sensitivity kernels and to quantify the effects of the scattering properties' heterogeneity to the measurements of temporal velocity changes.

1. DANA (2012): Dense Array for North Anatolia. International Federation of Digital Seismograph Networks. Dataset/Seismic Network. 10.7914/SN/YH_2012

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