THE EFFECT OF SCATTERING AND INTRINSIC ABSORPTION ON SITE- AND REGIONAL-KAPPA

Walter IMPERATORI [1], ***Sanjay S. BORA*** [2], ***Donat FAEH*** [1]

[1] Swiss Seismological Service, ETH, Zurich, Switzerland
[2] Earth Sciences, Indian Institute of Technology, Gandhinagar, India

The amplitude of seismic waves drops as these propagate from the source to the site of observation because of geometrical spreading, absorption, and scattering. Earthquake recordings at the surface usually exhibit a lack of high-frequency energy compared to theoretical source radiation models. The ability to predict the amount of energy that will reach a target location from an earthquake source represents a critical issue in ground motion prediction seismic and hazard studies. The high-frequency fall-off observed in acceleration spectra of ground motions is typically expressed in terms of the empirical frequency parameter kappa (Anderson and Hough, 1984), having both site and regional contributions. Altough kappa has a large impact in seismic hazard studies its physical origin is not yet fully understood. In this study we investigate the relative contribution of scattering and intrinsic attenuation by means of numerical simulations. We adopt a Monte Carlo technique to solve the radiative transfer equation in three-dimensional media characterized by laterally variable background velocity (e.g. basins) and/or variable scattering and intrinsic attenuation parameters. Multiple sets of synthetics seismograms spanning a broad frequency range (0-20Hz) are computed at hundreds of randomly distributed receivers between 20km and 100km from the source. We estimate kappa following the procedure of Anderson and Hough (1984) based on the linear regression of the synthetic log Fourier Amplitude Spectrum (FAS) between 2 Hz and 15Hz. Our analysis provides quantitative estimates of the contributions of the scattering and absorption mechanisms on the apparent attenuation measured from the Fourier spectra of ground motion recordings.