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# On the relationship between near-surface attenuation and scattering

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At high frequencies, the acceleration spectral amplitude decreases rapidly; this has been modeled with the spectral decay factor kappa ($\kappa$). The path-corrected component of $\kappa$, often called $\kappa 0$, is typically thought to be local site characteristic, quantifying attenuation related to waves propagating vertically through the shallow layers beneath the study site. Despite the known importance of $\kappa 0$ in a wide range of seismological applications, current approaches assume that all of the measured $\kappa 0$ is due to attenuation, therefore neglecting the possibility that $\kappa 0$ might also comprise a scattering component. This may cause overestimation of the actual attenuation effect on ground motion, and lead to possible overcorrections in GMPE adjustments.
To account for the scattering component, we will present a summary of statistical observations of the seismic wavefield. Its intrinsic properties show a clear dependency on the local shallow subsoil conditions. Differences in the structural heterogeneity of the shallow subsoil layers can produce different scattering regimes, therefore changing the character of motion from nearly ballistic to diffusive on frequency-dependent timescales for all materials. Such deviations from the ballistic behavior can be seen as indicative for the structural heterogeneities and the associated scatter. Quantifying the amount of scattering may allow computing a lower bound estimate for $\kappa 0$ values. This means that, rather than simply being a modelling parameter, $\kappa 0$ can be considered a real physical variable and should be treated as such.