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Seismic attenuation parameters in the W-Bohemia/Vogtland region from elastic and acoustic radiative transfer theory

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We estimate frequency-dependent seismic scattering and intrinsic attenuation parameters for the crustal structure beneath the W-Bohemia/Vogtland swarm earthquake region close to the border of Czech Republic and Germany. The parameter estimations are based on fitting synthetic envelopes modeled using elastic and acoustic radiative transfer theory to observed seismogram envelopes from 14 shallow local events from the October 2008 W-Bohemia/Vogtland earthquake swarm. The two different methods yield similar results for the estimated crustal parameters and show a comparable frequency dependence of both transport mean free path and intrinsic absorption path length. Results suggest, that intrinsic seismic attenuation is larger than attenuation due to scattering of seismic energy in the W-Bohemia/Vogtland region for the investigated epicentral distance range and frequency bands from 3 to 24 Hz. From the elastic simulations we conclude, that forward scattering is required to explain the data, however, the strength of forward scattering is not resolvable. The elastic approach shows smaller errors in the parameter estimation compared to the results of the acoustic simulations. The frequency dependence of the transport mean free path suggests a random medium described by a nearly exponential autocorrelation function. However the parameters describing this random medium, fluctuation strength and correlation length, cannot be estimated independently, but only a combination of the parameters related to the transport mean free path of the medium can be computed. We furthermore conclude from the results of the elastic simulations, that it is not possible to resolve the value of the mean free path of the random medium.