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Crustal Seismic Attenuation in Germany Measured with Acoustic Radiative Transfer Theory

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This work is carried out in the context of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). As part of this treaty a verification regime was introduced to detect, locate and characterize nuclear explosion testings. The study of seismology can provide essential information in the form of broadband waveform recordings for the identification and verification of these critical events. A profound knowledge of the Earth's subsurface between source and receiver is required for a detailed description of the seismic wave field. In addition to underground parameters such as seismic velocity or anisotropy, information about seismic attenuation values of the medium are required.

Goal of this study is the creation of a comprehensive model of crustal seismic attenuation in Germany and adjacent areas. Over 20 years of earthquake data from the German Central Seismological Observatory data archive is used to estimate the spatial dependent distribution of seismic intrinsic and scattering attenuation of S-waves for frequencies between 0.5 and 20 Hz. The attenuation models are estimated by fitting synthetic seismogram envelopes calculated with acoustic radiative transfer theory to observed seismogram envelopes. This theory describes the propagation of seismic S-energy under the assumption of multiple isotropic scattering, the crustal structure of the scattering medium is hereby represented by a half-space model.

We present preliminary results of the spatial distribution of intrinsic attenuation represented by the absorption path length, as well as of scattering attenuation in terms of the mean free path and compare the outcomes to results from previous studies. Furthermore catalog magnitudes are compared to moment magnitudes estimated during the inversion process. Additionally site amplification factors of the stations are presented.