Seismic attenuation analysis in the central part of the Leipzig-Regensburg fault zone using the Multiple Lapse Time Window Analysis and Qopen

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Seismic attenuation provides valuable information about the structure of the crust. For the analysis of seismic attenuation in the central part of the Leipzig-Regensburg fault zone in Germany, where numerous areas of intracontinental earthquake swarms are located, we use 18 of the region’s strongest earthquakes from the period 2008 to 2019 with a magnitude between 1.4 and 3.0 in the frequency range between 3 and 34 Hz. Two different methods were used to determine the frequency-dependent scattering and the intrinsic attenuation on one hand and to compare the two methods with respect to their results on the other hand. Both methods, the Multiple Lapse Time Windows Analysis (MLTWA) and the Qopen method use the acoustic radiative transfer theory for forward modelling to generate synthetic data and fit them to the observed data. As a by-product of Qopen, we also obtain the energy site amplifications of the stations used in the inversion, as well as the estimated moment magnitudes of the inverted earthquakes. In addition, factors that influence the inversion were investigated. Different combinations of inversion parameters were tested for the MLTWA, as well as the influence of the window length on the result of Qopen. The results from both methods provide similar results within their error bars, with intrinsic attenuation being stronger than scattering and overall, rather low attenuation values compared to other regions.