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Analysis of the diffusive properties of a strongly scattering medium on the propagation of acoustic energy

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Discriminating the effects of scattering attenuation caused by structural properties and the intrinsic attenuation caused by media properties from the propagation of seismic energy has been a long standing problem in geophysical imaging. Rock deformation laboratory experiments provide an opportunity to test different tomographic methods, initially designed for the field scale, within a controlled environment where the structural and media properties are already known. Acoustic emission data recorded during enucleation, growth and coalescence of laboratory scale fractures were recorded on an array of 1 MHz Piezo-Electric transducers and inverted using a near-receiver diffusive approximation of the reduction of seismic energy density with time. Coefficients for scattering and attenuation properties are obtained, and then analysed to highlight the physical properties of the fractured medium. Results suggest a frequency sensitivity to the mean free path between, and acoustic impedance of, scattering features resulting in acoustic resonance of the propagating wave.