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固液共存系の MRI 測定に基づく波動伝播シミュレーション（その２）
Numerical simulation of wave propagation in the media based on MRI measurement of partially frozen brines (Part2)

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We used partially frozen brine as a solid-liquid coexistence system to investigate attenuation phenomena in laboratory experiments. Attenuation results measured from experimental data are not entirely due to the intrinsic properties of the ice-brine coexisting system; a component of attenuation due to scattering effects is also included in the estimate. The level of scattering attenuation is related to the magnitude heterogeneity of acoustic impedance between ice and unfrozen brine. We obtained a series of two-dimensional apparent diffusion coefficient (ADC) maps of the ice-brine coexisting system using a diffusion-weighted magnetic resonance imaging (DW-MRI) technique. A series of two-dimensional MR slices of the ice-brine coexisting system exhibits strongly heterogeneous characteristics. The purpose of this study is to characterize scattering phenomena on synthetic data generated from the information of the microstructure of an ice-brine coexisting system. We constructed a synthetic seismic data set propagating through two-dimensional media based on the ADC maps, and generated synthetic data with a second-order finite difference scheme for the two-dimensional acoustic wave equation. Quantitative characterization of heterogeneities of two-dimensional MR slices and correlation with scattering attenuation results is helpful to understand the variation of attenuation with azimuth. We quantified the microstructure of an ice-brine coexisting system using spatial autocorrelation functions (ACF) whose shape is directly related to microstructural spatial changes.

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