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Complex interfaces of granular media: multiscale characterization and effective medium modeling

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Seafloor is a complex geological interface : the acoustic reflectivity strongly depends on the sonar frequency which can be from few to hundreds kHz. In order to understand the physical processes involved, we have developed a multiscale acoustic method based on the wavelet transform properties : we introduce this theoretical approach first applied on homogeneous discontinuities. Then, we have developed acoustic experiments where the discontinuties are complex interfaces : we present the experimental setup and describe the results measured on granular media made of monodisperse glass beads. For this seafloor modeling, where all parameters are known, we put in evidence five frequency ranges corresponding to particular acoustic regimes: we give physical interpretations based on the analysis of effective medium modeling. From low to high frequencies, a strong transition is observed between propagation and scattering phenomena. Going further in this study, we illustrate the results on a bimodal glass bead distribution where high frequency scattering can be isolated using an original experimental approach.