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The non-linear measurement operator for scattering in layered media

The essential inverse problem in the context of acoustic imaging is to infer physical parameters from measured data, where parameters are mapped to data by the measurement operator. Since the measurement operator is non-linear and poorly understood, a standard approach to the inverse problem is to consider the linearized measurement operator, and view data as arising from perturbation of a given set of parameters. We present recent results concerning layered media that offer an alternative approach. We show that the non-linear measurement operator can be analyzed directly, obviating the need for linearization. The key result is that the measurement operator itself is governed by a PDE with smooth coefficients.