Inverse Boundary Value Problems Arising in Nonlinear Acoustic Imaging

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In nonlinear acoustic imaging, the propagation of ultrasound waves can be modeled using the Westervelt equation, a quasilinear wave equation. In this talk, we will discuss inverse problems related to this equation, particularly focusing on various damping effects. We will talk about determining both the nonlinearity and damping coefficients in two specific contexts: a weakly damped model and a strongly damped one. For the weakly damped Westervelt equation, our approach involves using multi-fold linearization and the nonlinear interactions of distorted plane waves, based on the work by Kurylev, Lassas, and Uhlmann. In the case of the strongly damped Westervelt equation, our strategy involves constructing a complex geometric optics solution and applying Hörmander's fundamental solutions to control the remainder term.