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Title: Monotonicity and localized potentials for coefficient and shape inverse problems.

Abstract: We study two related inverse problems in electrical conductivity. In the first, we aim to detect a corrosion coefficient between two layers of a conducting medium from the Neumann-to-Dirichlet map, motivated by non-destructive testing. Using monotonicity estimates, we prove global uniqueness and a Lipschitz stability result. Notably, the Lipschitz constant can be explicitly computed from a priori data by solving finitely many well-posed PDEs, without relying on quantitative unique continuation or analytic estimates. Our approach employs standard unique continuation, the Runge approximation, monotonicity, and localized potentials.

In the second problem, we consider the recovery of conductivity discontinuities from boundary measurements. We introduce a shape reconstruction method that combines the monotonicity and level-set approaches. The monotonicity method provides an accurate initial guess for the level-set evolution, improving convergence and reliability. Numerical results illustrate the effectiveness of this combined strategy.