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Global counterexamples to uniqueness for a Calderón problem with C^k conductivities

Let Ω be a bounded subset of $\mathbb{R}^n$ with C^∞ boundary, where $n \geq 3$, and let $\gamma = (\gamma^{ij})$ be a bounded measurable function on $\overline{\Omega}$ taking values in the set $\mathcal{S}_n$ of positive definite $n \times n$ symmetric matrices. The Calderón inverse problem consists in recovering the map γ from the from the knowledge of the Dirichlet-to-Neumann map at fixed frequency for the operator $L_\gamma = -\partial_i(\gamma^{ij}\partial_j)$, up to some gauge equivalences induced by the invariance properties of the Dirichlet-to-Neumann map. We obtain counterexamples to uniqueness for the Calderón problem by showing that for any smooth map γ and any frequency that does not belong to the Dirichlet spectrum of L_γ, there exists, for any $k \geq 1$ and any $\epsilon > 0$, a pair of non gauge-equivalent maps γ_1, γ_2 of class C^k which are ϵ-close to γ in the $C^k(\overline{\Omega}, \mathcal{S}_n)$ topology, such that their Dirichlet-to-Neumann maps are equal. This is joint work with Thierry Daudé (Besançon), Bernard Helffer (Nantes) and François Nicoleau (Nantes).