GLOBAL UNIQUENESS FOR A
NON-OVERDETERMINED INVERSE
CONDUCTIVITY PROBLEM IN UNBOUNDED
DOMAINS

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Abstract

In this paper we show that sufficiently smooth coefficients of the elliptic operator
$\nabla_x \cdot \sigma(x') \nabla_x - c(x')$, $x \in \mathbb{R}^3$, $x' \in \mathbb{R}^2$ can be uniquely determined from the Cauchy data
given on a strip in the plane $\{x_3 = 0\}$. This is an extension of Tikhonov’s formulation of
the one-dimensional inverse problem of electric prospecting to two dimensions. In this
formulation, the number of variables in the Cauchy data equals the number of variables
in unknown coefficients. This is referred to the concept of non-overdeterminacy. Unlike
the Dirichlet-to-Neumann map defined on the entire boundary of a bounded domain, the
position of a pointlike electrode injecting electric currents into a domain is assumed to
be fixed, and such a domain is assumed to be unbounded. The method of Carleman esti-
mates combined with both the direct Fourier and inverse Laplace transforms is adopted
to establish the global uniqueness theorem. Also, we establish the global uniqueness
result for a corresponding inverse source problem arising in gravimetry prospecting.

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non-overdeterminacy, Carleman estimates, global uniqueness

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