

# Multilevel computational techniques for inverse electromagnetic problems in 3D

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Inverse problems involving recovery of distributed parameter functions arise in many applications. Many practical instances require electromagnetic data inversion, where the forward problem comprises Maxwell's equations for moderate frequencies. Realistic instances of such problems in 3D can be very computationally intensive and require care in the selection and development of appropriate algorithms.

In this talk I will describe work we have been doing in the context of a project involving geophysical mining applications with the objective of making such computations practically feasible.

The necessary conditions for the inverse optimization problem yield a large, nonlinear, tightly coupled set of PDEs. We devise multigrid methods coupled with preconditioned Krylov solvers for the rapid solution of such systems.

Our results will be demonstrated on practical examples. Collaborators: E. Haber, D. Oldenburg and D. Aruliah