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Nota di contenuto	Cover; Contents; Preface; Part I: Introduction to Inversion Theory; Chapter 1. Forward and inverse problems in geophysics; 1.1 Formulation of forward and inverse problems for different geophysical fields; 1.2 Existence and uniqueness of the inverse problem solutions; 1.3 Instability of the inverse problem solution; Chapter 2. ILL-Posed problems and the methods of their solution; 2.1 Sensitivity and resolution of geophysical methods; 2.2 Formulation of well-posed and ill-posed problems; 2.3 Foundations of regularization methods of inverse problem solution; 2.4 Family of stabilizing functionals 2.5 Definition of the regularization parameterPart II: Methods of the Solution of Inverse Problems; Chapter 3. Linear discrete inverse problems; 3.1 Linear least-squares inversion; 3.2 Solution of the purely underdetermined problem; 3.3 Weighted least-squares method; 3.4 Applying the principles of probability theory to a linear inverse problem; 3.5 Regularization methods; 3.6 The Backus-Gilbert Method; Chapter 4. Iterative solutions of the linear inverse problem; 4.1 Linear

operator equations and their solution by iterative methods; 4.2 A generalized minimal residual method  
 4.3 The regularization method in a linear inverse problem solution  
 Chapter 5. Nonlinear inversion technique; 5.1 Gradient-type methods; 5.2 Regularized gradient-type methods in the solution of nonlinear inverse problems; 5.3 Regularized solution of a nonlinear discrete inverse problem; 5.4 Conjugate gradient re-weighted optimization; Part III: Geopotential Field Inversion; Chapter 6. Integral representations in forward modeling of gravity and magnetic fields; 6.1 Basic equations for gravity and magnetic fields  
 6.2 Integral representations of potential fields based on the theory of functions of a complex variable  
 Chapter 7. Integral representations in inversion of gravity and magnetic data; 7.1 Gradient methods of gravity inversion; 7.2 Gravity field migration; 7.3 Gradient methods of magnetic anomaly inversion; 7.4 Numerical methods in forward and inverse modeling; Part IV: Electromagnetic Inversion; Chapter 8. Foundations of electromagnetic theory; 8.1 Electromagnetic field equations; 8.2 Electromagnetic energy flow; 8.3 Uniqueness of the solution of electromagnetic field equations  
 8.4 Electromagnetic Green's tensors  
 Chapter 9. Integral representations in electromagnetic forward modeling; 9.1 Integral equation method; 9.2 Family of linear and nonlinear integral approximations of the electromagnetic field; 9.3 Linear and non-linear approximations of higher orders; 9.4 Integral representations in numerical dressing; Chapter 10. Integral representations in electromagnetic inversion; 10.1 Linear inversion methods; 10.2 Nonlinear inversion; 10.3 Quasi-linear inversion; 10.4 Quasi-analytical inversion; 10.5 Magnetotelluric (MT) data inversion  
 Chapter 11. Electromagnetic migration imaging

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## Sommario/riassunto

This book presents state-of-the-art geophysical inverse theory developed in modern mathematical terminology. The book brings together fundamental results developed by the Russian mathematical school in regularization theory and combines them with the related research in geophysical inversion carried out in the West. It presents a detailed exposition of the methods of regularized solution of inverse problems based on the ideas of Tikhonov regularization, and shows the different forms of their applications in both linear and nonlinear methods of geophysical inversion. This text is the first t

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