

1. Record Nr.	UNINA9910811684503321
Autore	Zhdanov Mikhail Semenovich
Titolo	Inverse theory and applications in geophysics / / Michael S. Zhdanov
Pubbl/distr/stampa	Amsterdam, Netherlands : , : Elsevier, , 2015 ©2015
ISBN	0-444-62712-X
Edizione	[Second edition.]
Descrizione fisica	1 online resource (731 p.)
Collana	Methods in Geochemistry and Geophysics ; ; v.36
Disciplina	550.1515
Soggetti	Inversion (Geophysics) Geophysics - Measurement Functional analysis
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Front Cover; Inverse Theory and Applications in Geophysics; Copyright; Dedication; Contents; Preface to the Second Edition; Preface; Part I: Introduction to Inversion Theory; Chapter 1: Forward and Inverse Problems in Science and Engineering; 1.1 Formulation of Forward and Inverse Problems for Different Physical Fields; 1.1.1 Gravity Field; 1.1.2 Magnetic Field; 1.1.3 Electromagnetic Field; 1.1.4 Seismic Wavefield; 1.2 Existence and Uniqueness of the Inverse Problem Solutions; 1.2.1 Existence of the Solution; 1.2.2 Uniqueness of the Solution; 1.2.3 Practical Uniqueness 1.3 Instability of the Inverse Problem Solution References; Chapter 2: Ill-Posed Problems and the Methods of Their Solution; 2.1 Sensitivity and Resolution of Geophysical Methods; 2.1.1 Formulation of the Inverse Problem in General Mathematical Spaces; 2.1.2 Sensitivity; 2.1.3 Resolution; 2.2 Formulation of Well-Posed and Ill-Posed Problems; 2.2.1 Well-Posed Problems; 2.2.2 Conditionally Well-Posed Problems; 2.2.3 Quasi-Solution of the Ill-Posed Problem; 2.3 Foundations of Regularization Methods of Inverse Problem Solution; 2.3.1 Regularizing Operators; 2.3.2 Stabilizing Functionals 2.3.3 Tikhonov Parametric Functional2.4 Family of Stabilizing Functionals; 2.4.1 Stabilizing Functionals Revisited; 2.4.2 Representation of a Stabilizing Functional in the Form of a Pseudo-

Quadratic Functional; 2.5 Definition of the Regularization Parameter; 2.5.1 Optimal Regularization Parameter Selection; 2.5.2 L-Curve Method of Regularization Parameter Selection; References; Part II: Methods of the Solution of Inverse Problems; Chapter 3: Linear Discrete Inverse Problems; 3.1 Linear Least-Squares Inversion; 3.1.1 The Linear Discrete Inverse Problem 3.1.2 Systems of Linear Equations and Their General Solutions 3.1.3 Minimization of the misfit functional; 3.1.3 The Data Resolution Matrix; 3.2 Solution of the Purely Underdetermined Problem; 3.2.1 Underdetermined System of Linear Equations; 3.2.2 The Model Resolution Matrix; 3.3 Weighted Least-Squares Method; 3.4 Applying the Principles of Probability Theory to a Linear Inverse Problem; 3.4.1 Some Formulae and Notations from Probability Theory; 3.4.2 Maximum Likelihood Method; 3.4.3 Chi-Square Fitting; 3.5 Regularization Methods; 3.5.1 The Tikhonov Regularization Method 3.5.2 Application of SLDM Method in Regularized Linear Inverse Problem Solution 3.5.3 Integrated Sensitivity; 3.5.4 Definition of the Weighting Matrices for the Model Parameters and Data; 3.5.5 Controlled Sensitivity; 3.5.6 Approximate Regularized Solution of the Linear Inverse Problem; 3.5.7 The Levenberg-Marquardt Method; 3.5.8 The Maximum a Posteriori Estimation Method (the Bayes Estimation); 3.6 The Backus-Gilbert Method; 3.6.1 The Data Resolution Function; 3.6.2 The Spread Function; 3.6.3 Regularized Solution in the Backus-Gilbert Method; References

Chapter 4: Iterative Solutions of the Linear Inverse Problem

Sommario/riassunto

Geophysical Inverse Theory and Applications, Second Edition, 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. It's the first book of its kind to treat many kinds of inversion and imaging techni
