

1. Record Nr.	UNINA9910633924603321
Titolo	Methods and technologies for measuring the Earth's gravity field parameters / V. G. Peshekhanov, O. A. Stepanov, editors
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2022] ©2022
ISBN	3-031-11158-3
Descrizione fisica	1 online resource (396 pages)
Collana	Earth systems data and models ; ; Volume 5
Disciplina	526.7
Soggetti	Gravimeters (Geophysical instruments) Gravity - Measurement
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Intro -- Preface -- About the Book -- Contents -- Abbreviations -- 1 Instruments for Measuring Gravity -- 1.1 Absolute Gravimeters -- 1.1.1 Types and Designs of Absolute Ballistic Gravimeters -- 1.1.2 Sources of Uncertainties and Corrections in Measurements with Absolute Ballistic Gravimeters -- 1.1.3 Metrological Assurance of Absolute Gravimeters -- 1.1.4 International Comparisons of Absolute Gravimeters -- 1.1.5 Comparisons of Absolute Gravimeters: The Results -- 1.1.6 Practical Applications of Absolute Free-Fall Acceleration Measurements -- 1.1.7 Conclusions -- 1.2 Chekan-Series Relative Gravimeters -- 1.2.1 Gravimeter Parts -- 1.2.2 Gravimeter Sensing Element -- 1.2.3 Biaxial Gyro Platform of the Gravimeter -- 1.2.4 Mathematical Model of the Gravimeter Sensing Element -- 1.2.5 Algorithms for Gyro Platform Correction -- 1.2.6 Calibration and Verification of the Chekan-AM Gravimeter -- 1.2.7 Conclusions -- 1.3 GT-2 Relative Gravimeters -- 1.3.1 Gravimeter Parts -- 1.3.2 Gravimeter Sensing Element -- 1.3.3 Circuit for Integrated Correction of the Gyro Platform Position -- 1.3.4 Mathematical Models of the Channels of Inertial Sensing Elements -- 1.3.5 Analysis of the Gravimeter Main Errors -- 1.3.6 Main Tasks of the Gravimeter Central Processing Unit -- 1.3.7 Conclusions -- References -- 2 Data Processing Methods for Onboard Gravity Anomaly Measurements -- 2.1 Chekan-Series Gravimeter Data Acquisition

and Processing Software -- 2.1.1 Calibration and Diagnostics of the Gravimeter Equipment -- 2.1.2 Real-Time Algorithms and Software -- 2.1.3 Marine Gravity Measurement Processing -- 2.1.4 Airborne Gravity Measurement Processing -- 2.1.5 Postprocessing of Gravimetric Survey Data -- 2.1.6 Conclusion -- 2.2 Data Processing in GT-2 Airborne Gravimeters -- 2.2.1 Airborne Gravimetry Software -- 2.2.2 Software for GNSS Solutions.
2.2.3 Software for INS/GNSS Integration -- 2.2.4 Software for the Solution of the Basic Gravimetry Equation -- 2.2.5 Conclusion -- 2.3 Optimal and Adaptive Filtering and Smoothing Methods for Onboard Gravity Anomaly Measurements -- 2.3.1 General Formulation and Solution of Optimal Filtering and Smoothing Problems -- 2.3.2 Optimal Filtering and Smoothing Algorithms for Onboard Gravity Anomaly Measurements -- 2.3.3 Stationary Estimation Algorithms and Their Performance Analysis -- 2.3.4 Model and Parametric Identification of Gravity Anomaly and Measurement Errors Using Onboard Gravity Measurements -- 2.3.5 The Results of Using Adaptive Filtering and Smoothing Algorithms in Airborne Gravity Anomaly Measurements -- 2.3.6 Conclusion -- 2.4 Suboptimal Smoothing in Marine Gravimetric Surveys Using GT-2M Gravimeters -- 2.4.1 Constant-Delay Optimal and Suboptimal Smoothers for Continuous-Time Systems -- 2.4.2 Suboptimal Gravimetric Filter -- 2.4.3 Frequency Properties of the Suboptimal Gravimetric Filter -- 2.4.4 Results of the Experimental Data Processing -- 2.4.5 Conclusion -- 2.5 Using Spherical Wavelet Expansion to Combine Airborne Gravimetry Data and Global Gravity Field Model Data -- 2.5.1 Spherical Wavelet Expansion and Multiscale Representation of the Anomalous Gravity Field -- 2.5.2 Technique of Local Gravity Anomaly Determination from Airborne Gravimetry Data and Global Gravity Field Model Data Using Multiscale Representation -- 2.5.3 Multiscale Representation of Gravity Anomaly Based on Combination of Airborne Gravimetry Data and Global Gravity Field Model Data -- 2.5.4 Results of the Real Data Processing -- 2.5.5 Conclusion -- References -- 3 Methods for Determination and Calculation of Deflections of the Vertical -- 3.1 DOV Determination on a Moving Base -- 3.1.1 Basic Methods for DOV Determination.
3.1.2 Features of DOV Determination on a Moving Base -- 3.1.3 Classification Criteria of DOV Determination Methods -- 3.1.4 Qualitative Comparative Analysis of the Methods -- 3.1.5 Conclusion -- 3.2 DOV Determination with the Use of an Automated Zenith Telescope -- 3.2.1 General Principles of Determining Astronomical Coordinates in Geodetic Astronomy -- 3.2.2 Description of the AZT and Its Principle of Operation -- 3.2.3 Algorithm for Determining DOV Components Using the AZT and Error Analysis -- 3.2.4 Field Studies of the AZT Prototype -- 3.2.5 Conclusion -- 3.3 Inertial Geodetic Method for DOV Determination -- 3.3.1 Inertial Geodetic Method Using Positional and Velocity Measurements -- 3.3.2 Using ZUPT Technology -- 3.3.3 DOV Determination in High Latitudes -- 3.3.4 Simulation Results -- 3.4 Conclusion -- References -- 4 Studying the Gravity Field in Hard-to-Reach Areas of the Earth -- 4.1 State of Knowledge of the Gravity Field in the Arctic -- 4.1.1 Brief Historical Overview of Russian Gravimetric Surveys in the Arctic -- 4.1.2 Modern Russian Arctic Airborne Gravimetry -- 4.1.3 Modern International Arctic Airborne Gravimetry -- 4.1.4 Conclusions -- 4.2 The Results of the Gravimetric Surveys with Chekan Gravimeters in Hard-to-Reach Areas -- 4.2.1 Marine Gravimetric Surveys in the Polar Regions -- 4.2.2 Regional Airborne Gravimetric Surveys -- 4.2.3 Carriers Used for Gravimetric

Measurements -- 4.2.4 Conclusions -- 4.3 GT-2A Gravimeter All-Latitude Versions -- 4.3.1 Using Multi-antenna GNSS Receivers -- 4.3.2 Quasi-Geodetic Coordinates -- 4.3.3 All-Latitude Version of the GT-2A Gravimeter -- 4.3.4 Method for Calibration of Instrumental Errors of the Gimbal Suspension Angle Sensor -- 4.3.5 Test and Operation Results -- 4.3.6 Polar Versions of the GT-2A Gravimeter -- 4.3.7 Conclusions -- References -- 5 Advanced Gravity Field Survey Methods.

5.1 Airborne Vector Gravimetry Based on Strapdown Inertial Navigation Systems -- 5.1.1 Airborne Vector Gravimetry Equations -- 5.1.2 Airborne Vector Gravimetry Error Equations -- 5.1.3 Models of Aiding Measurements -- 5.1.4 Selected Approaches to the Solution of the Airborne Vector Gravimetry Problem -- 5.1.5 Spectral Analysis of the Airborne Vector Gravimetry Accuracy -- 5.1.6 Algorithm for Gravity Disturbance Vector Estimation Based on a Local Harmonic Model -- 5.1.7 Conclusions -- 5.2 Current State and Outlook for the Development of Instruments for Onboard Measurements of Second Derivatives of Geopotential -- 5.2.1 Principles and Challenges of Measuring the Second Derivatives of Geopotential -- 5.2.2 Gradiometers for High-Precision Autonomous Navigation -- 5.2.3 Gradiometers for Mineral Exploration -- 5.2.4 Gradiometers for Space Missions -- 5.2.5 Promising Gravity Gradiometers -- 5.2.6 Expanding the Scope of Gradiometer Applications -- 5.2.7 Conclusions -- 5.3 Current State and Outlook for the Development of Cold-Atom Gravimeters -- 5.3.1 Basic Physical Principles of Cold-Atom Gravimeters -- 5.3.2 Sensitivity and Accuracy of the Cold-Atom Gravimeter -- 5.3.3 Laser Cooling of Atoms -- 5.3.4 Physical Design of the Atomic Interferometer-Gravimeter -- 5.3.5 Modern Designs of Atomic Interferometers -- 5.3.6 Gravimeter Based on Cold Atoms Trapped in an Optical Dipole Trap -- 5.3.7 Outlook for the Development of Cold-Atom Gravimeters -- 5.3.8 Conclusions -- References -- 6 Earth's Gravity Field Models and Their Application -- 6.1 Estimation of Accuracy of Modern Earth's Gravity Field Models -- 6.1.1 A Priori Accuracy Estimates -- 6.1.2 A Posteriori Accuracy Estimates -- 6.1.3 Estimation of Accuracy of Geoid Height Models -- 6.1.4 Estimation of Accuracy of the Global Models of the Earth's Gravity Field in the Arctic -- 6.1.5 Conclusions.

6.2 Using the Earth's Gravity Field Model in Marine Gravity Measurements -- 6.2.1 Comparison of Satellite Data with Marine Gravity Measurements -- 6.2.2 Method for Tying Marine Measurements to the Earth's Gravity Field Model -- 6.2.3 Conclusions -- 6.3 Map-Aided Navigation -- 6.3.1 Statement and General Solution of Map-Aided Navigation Problem Based on the Nonlinear Filtering Theory -- 6.3.2 Algorithms Based on Gaussian Approximations -- 6.3.3 Algorithms Based on Gaussian Sum Approximations -- 6.3.4 Point Mass Method -- 6.3.5 Sequential Monte Carlo Methods -- 6.3.6 Analysis of the Accuracy of Filtering Algorithms -- 6.3.7 Comparison of Filtering Algorithms -- 6.3.8 Conclusions -- 6.4 Estimating the Navigation Informativity of the Earth's Gravity Field -- 6.4.1 Choosing a Model of the Earth's Gravity Field -- 6.4.2 Methods for Estimating the Navigation Informativity of the Earth's Gravity Field -- 6.4.3 Results of Experimental Studies -- 6.4.4 Conclusions -- References -- Appendix.