Uncertainty Analysis In Reservoir Characterization M96 Aapg Memoir

Quantitative Seismic Interpretation demonstrates how rock physics can be applied to predict reservoir parameters, such as lithologies and pore fluids, from seismically derived attributes. The authors provide an integrated methodology and practical tools for quantitative interpretation, uncertainty assessment, and characterization of subsurface reservoirs using well-log and seismic data. They illustrate the advantages of these new methodologies, while providing advice about limitations of the methods and traditional pitfalls. This book is aimed at graduate students, academics and industry professionals working in the areas of petroleum geoscience and exploration seismology. It will also interest environmental geophysicists seeking a quantitative subsurface characterization from shallow seismic data. The book includes problem sets and a case-study, for which seismic and well-log data, and Matlab codes are provided on a website (http://www.cambridge.org/9780521816014). These resources will allow readers to gain a hands-on understanding of the methodologies.

Decision Analysis for Petroleum Exploration By Paul D. Newendorp

This book presents a consistent methodology for making decisions under uncertain conditions, as is almost always the case. Tools such as value of information and value of flexibility are explored as a means to make more complex and nuanced decisions. The book develops the complete formalism for assessing the value of acquiring information with two novel approaches. Firstly, it integrates the fuzzy characteristics of data, and secondly develops a methodology for assessing data acquisition actions that optimize the value of projects from a holistic perspective. The book also discusses the formalism for including flexibility in the project decision assessment. Practical examples of oil- and gas-related decision problems are included and discussed to facilitate the learning process. This book provides valuable advice and case studies applicable to engineers, researchers, and graduate students, particularly in the oil and gas industry and pharmaceutic industry.

This book integrates those critical geologic aspects of reservoir formation and occurrence with engineering aspects of reservoirs, and presents a comprehensive treatment of the geometry, porosity and permeability evolution, and producing characteristics of carbonate reservoirs. The three major themes discussed are: • the geometry of carbonate reservoirs and relationship to original depositional facies distributions • the origin and types of porosity and permeability systems in carbonate reservoirs and their relationship to post-depositional diagenesis • the relationship between depositional and diagenetic facies and producing characteristics of carbonate reservoirs, and the synergistic geologic-engineering approach to the exploitation of carbonate reservoirs. The intention of the volume is to fully aquaint professional petroleum geologists and engineers with an integrated geologic and engineering approach to the subject. As such, it presents a unique critical appraisal of the complex parameters that affect the recovery of hydrocarbon resources from carbonate rocks. The book may also be used as a text in petroleum geology and engineering courses at the advanced undergraduate and graduate levels.

Reservoir Characterization of Tight Gas Sandstones

Schlumberger Methods in Water Resources Evaluation Series No. 4

Fundamentals of Geostatistics in Five Lessons

Reservoir Characterization

Developing and Managing Assets in an Uncertain World, AAPG Memoir 96

Optimize Exploration and Production with Data-Driven Models

During last decade significant progress has been made in the oil indus try by using soft computing technology. Underlying this evolving technology there have, been ideas transforming the very language we use to describe problems with imprecision, uncertainty and partial truth. These developments offer exciting opportunities, but at the same time it is becoming clearer that further advancements are confronted by funda mental problems. The whole idea of how human process information lies at the core of the challenge. There are already new ways of thinking about the problems within theory of perception-based information. This theory aims to understand and harness the laws of human perceptions to dramatically im prove the processing of information. A matured theory of perception-based information is likely to be proper positioned to contribute to the solution of the problems and provide all the ingredients for a revolution in science, technology and business. In this context, Berkeley Initiative in Soft Computing (BISC), Univer sity of California, Berkeley from one side and Chevron-Texaco from another formed a Technical Committee to organize a Meeting entitled "State of the Art Assessment and New Directions for Research" to understand the signifi cance of the fields accomplishments, new developments and future directions. The Technical Committee selected and invited 15 scientists (and oil indus try experts as technical committee members) from the related disciplines to participate in the Meeting, which took place at the University of California, Berkeley, and March 15-17, 2002.

One of the main duties for reservoir engineers is reservoir study, which starts when a reservoir is explored and it continues until the reservoir abandonment. Reservoir study is a continual process and due to various reasons such as complexity at the surface and limited data, there are many uncertainties in reservoir modelling and characterization causing difficulties in reasonable history-matching and prediction phases of study. Experimental Design in Petroleum Reservoir Studies concentrates on experimental design, a trusted method in reservoir management, to analyze and take the guesswork out of the uncertainties surrounding the underdeveloped reservoir. Case studies from the Barnett shale and fractured reservoirs in the Middle East are just some of the practical examples included. Other relevant discussions on uncertainty in PVT, field performance data, and relevant outcomes of experimental design all help you gain insight into how better data can improve measurement tools, your model, and your reservoir assets. Apply the practical knowledge and know-how now with real-world case studies included Gain confidence in

deviating uncertain parameters surrounding the underdeveloped reservoir with a focus on application of experimental design Alleviate some of the guesswork in history-matching and prediction phrases with explanations on uncertainty analysis

Reservoir Characterization of Tight Gas Sandstones: Exploration and Development is essential reading for those working in oil and gas exploration (both in industry and academia) as it contains chapters that help them further understand all aspects of tight gas reservoirs. In this book, experts in industry and academia update readers on new methods of tight gas reservoir modeling and evaluation. As there are very limited published books in the field of tight sandstones, this book will benefit readers by making them familiar with state-of-art methods of tight gas sandstones characterization and evaluation. Features case studies from countries with considerable tight gas sandstones such as the United States, China, Canada and Australia Includes recent developments in sedimentological, petrophysical, reservoir modeling and fracking technologies of tight gas sandstone reservoirs Covers applications for the characterization and evaluation of tight sandstones for the methodologies presented

Use big data analytics to efficiently drive oil and gas exploration and production Harness Oil and Gas Big Data with Analytics provides a complete view of big data and analytics techniques as they are applied to the oil and gas industry. Including a compendium of specific case studies, the book underscores the acute need for optimization in the oil and gas exploration and production stages and shows how data analytics can provide such optimization. This spans exploration, development, production and rejuvenation of oil and gas assets. The book serves as a guide for fully leveraging data, statistical, and quantitative analysis, exploratory and predictive modeling, and fact-based management to drive decision making in oil and gas operations. This comprehensive resource delves into the three major issues that face the oil and gas industry during the exploration and production stages: Data management, including storing massive quantities of data in a manner conducive to analysis and effectively retrieving, backing up, and purging data Quantification of uncertainty, including a look at the statistical and data analytics methods for making predictions and determining the certainty of those predictions Risk assessment, including predictive analysis of the likelihood that known risks are realized and how to properly deal with unknown risks Covering the major issues facing the oil and gas industry in the exploration and production stages, Harness Big Data with Analytics reveals how to model big data to realize efficiencies and business benefits.

Theoretical Advances and Applications of Fuzzy Logic and Soft Computing

Carbonate Reservoir Characterization: A Geologic-Engineering Analysis

Soft Computing for Reservoir Characterization and Modeling

Applying Rock Physics Tools to Reduce Interpretation Risk

Seismic Reflections of Rock Properties

Anthropogenic Aquifer Recharge

Sustainable Geoscience for Natural Gas SubSurface Systems delivers many of the scientific fundamentals needed in the natural gas industry, including coal-seam gas reservoir characterization and fracture analysis modeling for shale and tight gas reservoirs. Advanced research includes machine learning applications for well log and facies analysis, 3D gas property geological modeling, and X-ray CT scanning to reduce environmental hazards. Supported by corporate and academic contributors, along with two well-distinguished editors, the book gives today's natural gas engineers both fundamentals and advances in a convenient resource, with a zero-carbon future in mind. Includes structured case studies to illustrate how new principles can be applied in practical situations Helps readers understand advanced topics, including machine learning applications to optimize predictions, controls and improve knowledge-based applications Provides tactics to accelerate emission reductions Teaches gas fracturing mechanics aimed at reducing environmental impacts, along with enhanced oil recovery technologies that capture carbon dioxide

Exploration and characterization of conventional and unconventional reservoirs using seismic technologies are among the main activities of upstream technology groups and business units of oil and gas operators. However, these activities frequently encounter difficulties in quantitative seismic interpretation due to remaining confusion and new challenges in the fast developing field of seismic petrophysics. Seismic Petrophysics in Quantitative Interpretation shows how seismic interpretation can be made simple and robust by integration of the rock physics principles with seismic and petrophysical attributes bearing on the properties of both conventional (thickness, net/gross, lithology, porosity, permeability, and saturation) and unconventional (thickness, lithology, organic richness, thermal maturity) reservoirs. Practical solutions to existing interpretation problems in rock physics-based amplitude versus offset (AVO) analysis and inversion are addressed in the book to streamline the workflows in

subsurface characterization. Although the book is aimed at oil and gas industry professionals and academics concerned with utilization of seismic data in petroleum exploration and production, it could also prove helpful for geotechnical and completion engineers and drillers seeking to better understand how seismic and sonic data can be more thoroughly utilized.
This comprehensive book highlights soft computing and geostatistics applications in hydrocarbon exploration and production, combining practical and theoretical aspects. It spans a wide spectrum of applications in the oil industry, crossing many discipline boundaries such as geophysics, geology, petrophysics and reservoir engineering. It is complemented by several tutorial chapters on fuzzy logic, neural networks and genetic algorithms and geostatistics to introduce these concepts to the uninitiated. The application areas include prediction of reservoir properties (porosity, sand thickness, lithology, fluid), seismic processing, seismic and bio stratigraphy, time lapse seismic and core analysis. There is a good balance between introducing soft computing and geostatistics methodologies that are not routinely used in the petroleum industry and various applications areas. The book can be used by many practitioners such as processing geophysicists, seismic interpreters, geologists, reservoir engineers, petrophysicist, geostatistians, asset mangers and technology application professionals. It will also be of interest to academics to assess the importance of, and contribute to, R&D efforts in relevant areas.
Unconventional Oil and Gas Resources Handbook: Evaluation and Development is a must-have, helpful handbook that brings a wealth of information to engineers and geoscientists. Bridging between subsurface and production, the handbook provides engineers and geoscientists with effective methodology to better define resources and reservoirs. Better reservoir knowledge and innovative technologies are making unconventional resources economically possible, and multidisciplinary approaches in evaluating these resources are critical to successful development. Unconventional Oil and Gas Resources Handbook takes this approach, covering a wide range of topics for developing these resources including exploration, evaluation, drilling, completion, and production. Topics include theory, methodology, and case histories and will help to improve the understanding,integrated evaluation, and effective development of unconventional resources. Presents methods for a full development cycle of unconventional resources, from exploration through production Explores multidisciplinary integrations for evaluation and development of unconventional resources and covers a broad range of reservoir characterization methods and development scenarios Delivers balanced information with multiple contributors from both academia and industry Provides case histories involving geological analysis, geomechanical analysis, reservoir modeling, hydraulic fracturing treatment, microseismic monitoring, well performance and refracturing for development of unconventional reservoirs
AVO
Quantitative Geosciences: Data Analytics, Geostatistics, Reservoir Characterization and Modeling
Geostatistical Reservoir Modeling
Reservoir Model Design
Likely Elucidations and Way Forward
Applied Statistical Modeling and Data Analytics
AVO (SEG Investigations in Geophysics No. 16) by Satinder Chopra and John Castagna begins with a brief discussion on the basics of seismic-wave propagation as it relates to AVO, followed by a discussion of the rock-physics foundation for AVO analysis including the use of Gassmann's equations and fluid substitution. Then, the early seismic observations and how they led to the birth of AVO analysis are presented. The various approximations for the Zoeppritz equations are examined, and the assumptions and limitations of each approximation are clearly identified. A section on the factors that affect seismic amplitudes and a discussion of the processing considerations important for AVO analysis are included. A subsequent section explores the various techniques used in AVO interpretation. Finally, topics including the influence of anisotropy in AVO analysis, the use of AVO inversion, estimation of uncertainty in AVO analysis, converted-wave AVO, and the future of the AVO method are discussed. Equally helpful to new entrants into the field as well as to seasoned workers, AVO will provide readers with the most up-to-date knowledge on amplitude variation with offset.
Applied Statistical Modeling and Data Analytics: A Practical Guide for the Petroleum Geosciences provides a practical guide to many of the classical and modern statistical techniques that have become established for oil and gas professionals in recent years. It serves as a "how to" reference volume for the practicing petroleum engineer or geoscientist interested in applying statistical methods in formation evaluation, reservoir characterization, reservoir modeling and management, and uncertainty quantification. Beginning with a foundational discussion of exploratory data analysis, probability distributions and linear regression modeling, the book focuses on fundamentals and practical examples of such key topics as multivariate analysis, uncertainty quantification, data-driven modeling, and experimental design and response surface analysis. Data sets from the petroleum geosciences are extensively used to demonstrate the applicability of these techniques. The book will also be useful for professionals dealing with subsurface flow problems in hydrogeology, geologic carbon sequestration, and nuclear waste

disposal. Authored by internationally renowned experts in developing and applying statistical methods for oil & gas and other subsurface problem domains Written by practitioners for practitioners Presents an easy to follow narrative which progresses from simple concepts to more challenging ones Includes online resources with software applications and practical examples for the most relevant and popular statistical methods, using data sets from the petroleum geosciences Addresses the theory and practice of statistical modeling and data analytics from the perspective of petroleum geoscience applications

This study presents an uncertainty analysis of Geologic Carbon Sequestration modeling in a naturally fractured reservoir at Teapot Dome, Wyoming. Structural & stratigraphic, residual, and solubility trapping mechanisms are the focus of this study, while mineral trapping is not considered. A reservoir-scale geologic model is built to model CO2 storage in the Tensleep Sandstone using a variety of site characterization data that have been collected, screened for accuracy, and analyzed. These data are from diverse sources, such as reservoir geology, geophysics, petrophysics, engineering, and analogs. Because fluid flow occurs in both matrix and fractures of the Tensleep Sandstone, both systems of heterogeneity must be incorporated into the geologic model. The matrix heterogeneity of the geologic model is developed through a hierarchical process of structural modeling, facies modeling, and petrophysical modeling. In structural modeling, the framework of the reservoir is conditioned to seismic data and well log interpretations. Based on the concept of flow units, the facies model, which is conditioned to a global vertical facies proportion curve that acts as `soft' data, is built geostatistically by the Sequential Indicator Simulation method. Then, the petrophysical properties (porosity) are modeled geostatistically within each facies through the Sequential Gaussian Simulation approach. A Discrete Fracture Network (DFN) is adopted as the method to model the distribution of open natural fractures in the reservoir. Basic inputs for the DFN model are derived from FMI logs, cores, and analogs. In addition, in combination with an artificial neural network analysis, 3D seismic attributes are used as fracture drivers to guide the modeling of fracture intensity distribution away from the boreholes. In DFN models, power laws are adopted to define the distribution of fracture intensity, length and aperture. To understand the effect of model complexity on CO2 storage predictions, a suite of increasingly simplified conceptual geologic model families are created with decreasing amount of site characterization data: a hierarchical stochastic model family conditioned to ' soft' data (FAM4), a simple stochastic facies model family (FAM3), a simple stochastic porosity model family (FAM2), and a homogeneous model family (FAM1). These families, representing alternative conceptual geologic models built with increasing reduced data, are simulated with the same CO2 injection test (20 years of injection at 1,000 Mscf/day), followed by 80 years of monitoring. Using the Design of Experiment, an efficient sensitivity analysis (SA) is conducted for all families, systematically varying uncertain input parameters, while assuming identical well configurations, injection rates, bottom-hole pressure constraints, and boundary conditions. The SA results are compared among the families to identify parameters that have the first order impact on predicting the CO2 storage ratio (SR) at two different time scales, i.e., end of injection and end of monitoring. This comparison indicates that, for this naturally fractured reservoir, the facies model is necessary to study the sensitivity characteristics of predicting the CO 2 storage behavior. The SA results identify matrix relative permeability, fracture aperture of fracture set 1, and fracture aperture of fracture set 2 as the statistically important factors. Based on the results of the SA, a response surface analysis is conducted to generate prediction envelopes of the CO2 storage ratio, which are also compared among the families at both times. Its results demonstrate that the SR variation due to the different modeling choices is relatively small. At the proposed storage site, as more than 90% of injected CO2 is probably mobile, short-term leakage risk is considered large, and it depends on the sealing ability of top formations.

The book is an overview of the diversity of anthropogenic aquifer recharge (AAR) techniques that use aquifers to store and treat water. It focusses on the processes and the hydrogeological and geochemical factors that affect their performance. This book is written from an applied perspective with a focus of taking advantage of global historical experiences, both positive and negative, as a guide to future implementation. Most AAR techniques are now mature technologies in that they have been employed for some time, their scientific background is well understood, and their initial operational challenges and associated solutions have been identified. However, opportunities exist for improved implementation and some recently employed and potential future innovations are presented. AAR which includes managed aquifer recharge (MAR) is a very important area of water resources management and there is no recent books that specifically and comprehensively addresses the subject.

Soft Computing and Intelligent Data Analysis in Oil Exploration

Petro-physics and Rock Physics of Carbonate Reservoirs

Evaluation and Development

Sustainable Geoscience for Natural Gas SubSurface Systems

Issues in Fossil Fuel Energy Technologies: 2011 Edition

Harness Oil and Gas Big Data with Analytics

This book on well test analysis, and the use of advanced interpretation models is volume 3 in the series Handbook of Petroleum Exploration and Production. The chapters in the book are: Principles of Transient Testing, Analysis Methods, Wellbore Conditions, Effect of Reservoir Heterogeneities on Well

Responses, Effect of Reservoir Boundaries on Well Responses, Multiple Well Testing, Application to Gas Reservoirs, Application to Multiphase Reservoirs, Special Tests, Practical Aspects of Well Test Interpretation.

Published in 2002, the first edition of Geostatistical Reservoir Modeling brought the practice of petroleum geostatistics into a coherent framework, focusing on tools, techniques, examples, and guidance. It emphasized the interaction between geophysicists, geologists, and engineers, and was received well by professionals, academics, and both graduate and undergraduate students. In this revised second edition, Deutsch collaborates with co-author Michael Pyrcz to provide an expanded (in coverage and format), full color illustrated, more comprehensive treatment of the subject with a full update on the latest tools, methods, practice, and research in the field of petroleum Geostatistics. Key geostatistical concepts such as integration of geologic data and concepts, scale considerations, and uncertainty models receive greater attention, and new comprehensive sections are provided on preliminary geological modeling concepts, data inventory, conceptual model, problem formulation, large scale modeling, multiple point-based simulation and event-based modeling. Geostatistical methods are extensively illustrated through enhanced schematics, work flows and examples with discussion on method capabilities and selection. For example, this expanded second edition includes extensive discussion on the process of moving from an inventory of data and concepts through conceptual model to problem formulation to solve practical reservoir problems. A greater number of examples are included, with a set of practical geostatistical studies developed to illustrate the steps from data analysis and cleaning to post-processing, and ranking. New methods, which have developed in the field since the publication of the first edition, are discussed, such as models for integration of diverse data sources, multiple point-based simulation, event-based simulation, spatial bootstrap and methods to summarize geostatistical realizations.

The chapters of the book are evolved from presentations made by selected participants at the 2005 BISC International Special Event, held at the University of California at Berkely. The papers include reports from the different front of soft computing in various industries and address the problems of different fields of research in fuzzy logic, fuzzy set and soft computing. The book provides a collection of forty-four articles in two volumes.

This book gives practical advice and ready to use tips on the design and construction of subsurface reservoir models. The design elements cover rock architecture, petrophysical property modelling, multi-scale data integration, upscaling and uncertainty analysis. Philip Ringrose and Mark Bentley share their experience, gained from over a hundred reservoir modelling studies in 25 countries covering clastic, carbonate and fractured reservoir types, and for a range of fluid systems – oil, gas and CO2, production and injection, and effects of different mobility ratios. The intimate relationship between geology and fluid flow is explored throughout, showing how the impact of fluid type, displacement mechanism and the subtleties of single- and multi-phase flow combine to influence reservoir model design. The second edition updates the existing sections and adds sections on the following topics: · A new chapter on modelling for CO2 storage · A new chapter on modelling workflows · An extended chapter on fractured reservoir modelling · An extended chapter on multi-scale modelling · An extended chapter on the quantification of uncertainty · A revised section on the future of modelling based on recently published papers by the authors The main audience for this book is the community of applied geoscientists and engineers involved in understanding fluid flow in the subsurface: whether for the extraction of oil or gas or the injection of CO2 or the subsurface storage of energy in general. We will always need to understand how fluids move in the subsurface and we will always require skills to model these quantitatively. The second edition of this reference book therefore aims to highlight the modelling skills developed for the current energy industry which will also be required for the energy transition of the future. The book is aimed at technical-professional practitioners in the energy industry and is also suitable for a range of Master's level courses in reservoir characterisation, modelling and engineering. • Provides practical advice and guidelines for users of 3D reservoir modelling packages • Gives advice on reservoir model design for the growing world-wide activity in subsurface reservoir modelling • Covers rock modelling, property modelling, upscaling, fluid flow and uncertainty handling • Encompasses clastic, carbonate and fractured reservoirs • Applies to multi-fluid cases and applications: hydrocarbons and CO2, production and storage; rewritten for use in the Energy Transition.

Seismic Petrophysics in Quantitative Interpretation

Proceedings of the International Field Exploration and Development Conference 2018

Value of Information and Flexibility

Markov Chain Monte Carlo Algorithm, Integrated 4D Seismic Reservoir Characterization and Uncertainty Analysis in a Bayesian Framework

Reservoir Characterization and Modeling

An Uncertainty Analysis of Modeling Geologic Carbon Sequestration in a Naturally Fractured Reservoir at Teapot Dome, Wyoming

Issues in Fossil Fuel Energy Technologies / 2011 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Fossil Fuel Energy Technologies. The editors have built Issues in Fossil Fuel Energy Technologies: 2011 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Fossil Fuel Energy Technologies in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Fossil Fuel Energy Technologies: 2011 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the

editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

This book comprises a selection of papers on theoretical advances and applications of fuzzy logic and soft computing from the IFSA 2007 World Congress, held in Cancun, Mexico, June 2007. These papers constitute an important contribution to the theory and applications of fuzzy logic and soft computing methodologies.

This book presents selected articles from the workshop on "Challenges in Petrophysical Evaluation and Rock Physics Modeling of Carbonate Reservoirs" held at IIT Bombay in November 2017. The articles included explore the challenges associated with using well-log data, core data analysis, and their integration in the qualitative and quantitative assessment of petrophysical and elastic properties in carbonate reservoirs. The book also discusses the recent trends and advances in the area of research and development of carbonate reservoir characterization, both in industry and academia. Further, it addresses the challenging concept of porosity portioning, which has huge implications for exploration and development success in these complex reservoirs, enabling readers to understand the varying orders of deposition and diagenesis and also to model the flow and elastic properties.

Accurate reservoir characterization is a key step in developing, monitoring, and managing a reservoir and optimizing production. To achieve accuracy and to ensure that all the information available at any given time is incorporated in the reservoirmodel, reservoir characterizationmust be dynamic. To achieve this goal, however, one starts with a simple model of the reservoir at a given time point (a static model). As new petrophysical, seismic, and production data become available, the reservoir model is updated to account for the changes in the reservoir. The updated model would be a better representative of the current status of the reservoir. Both static reservoir properties, such as porosity, permeability, and facies type; and dynamic reservoir properties, such as pressure, fluid saturation, and temperature, needs to be updated as more field data become available. Characterizing a reservoir by updating of both static and dynamic reservoir properties during the life of the field is referred to as dynamic reservoir characterization. Dynamic reservoir characterization is discussed in , dealing with time lapse or 4D geophysical data and reservoir monitoring. This chapter, however, focuses on static reservoir characterization.

Aquifer Characterization Techniques
Uncertainty Analysis and Reservoir Modeling
Geophysics for Petroleum Engineers
Making Decisions Under Uncertainties
Seismic Imaging Methods and Applications for Oil and Gas Exploration
Fuzzy Partial Differential Equations and Relational Equations

This book presents an overview of techniques that are available to characterize sedimentary aquifers. Groundwater flow and solute transport are strongly affected by aquifer heterogeneity. Improved aquifer characterization can allow for a better conceptual understanding of aquifer systems, which can lead to more accurate groundwater models and successful water management solutions, such as contaminant remediation and managed aquifer recharge systems. This book has an applied perspective in that it considers the practicality of techniques for actual groundwater management and development projects in terms of costs, technical resources and expertise required, and investigation time. A discussion of the geological causes, types, and scales of aquifer heterogeneity is first provided. Aquifer characterization methods are then discussed, followed by chapters on data upscaling, groundwater modelling, and geostatistics. This book is a must for every practitioner, graduate student, or researcher dealing with aquifer characterization .

Seismic Imaging Methods and Application for Oil and Gas Exploration connects the legacy of field data processing and imaging with new research methods using diffractions and anisotropy in the field of geophysics. Topics covered include seismic data acquisition, seismic data processing, seismic wave modeling, high-resolution imaging, and anisotropic modeling and imaging. This book is a necessary resource for geophysicist working in the oil and gas and mineral exploration industries, as well as for students and academics in exploration geophysics. Provides detailed methods that are used in the industry, including advice on which methods to use in specific situations Compares classical methods with the latest technologies to improve practice and application in the real world Includes case studies for further explanation of methods described in the book

Reservoir Characterization is a collection of papers presented at the Reservoir Characterization Technical Conference, held at the Westin Hotel-Galleria in Dallas on April 29-May 1, 1985. Conference held April 29-May 1, 1985, at the Westin Hotel—Galleria in Dallas. The conference was sponsored by the National Institute for Petroleum and Energy Research, Bartlesville, Oklahoma. Reservoir characterization is a process for quantitatively assigning reservoir properties, recognizing geologic information and uncertainties in spatial variability. This book contains 19 chapters, and begins with the geological characterization of sandstone reservoir, followed by the geological prediction of shale distribution within the Prudhoe Bay field. The subsequent chapters are devoted to determination of reservoir properties, such as porosity, mineral occurrence, and permeability variation estimation. The discussion then shifts to the utility of a Bayesian-type formalism to delineate qualitative ""soft"" information and expert interpretation of reservoir description data. This topic is followed by papers concerning reservoir simulation, parameter assignment, and method of calculation of wetting phase relative permeability. This text also deals with the role of discontinuous vertical flow barriers in reservoir engineering. The last chapters focus on the effect of reservoir heterogeneity on oil reservoir. Petroleum engineers, scientists, and researchers will find this book of great value.

Earth science is becoming increasingly quantitative in the digital age. Quantification of geoscience and engineering problems underpins many of the applications of big data and artificial intelligence. This book presents quantitative geosciences in three parts. Part 1 presents data analytics using probability, statistical and machine-learning methods. Part 2 covers reservoir characterization using several geoscience disciplines: including geology, geophysics, petrophysics and geostatistics. Part 3 treats reservoir modeling, resource evaluation and uncertainty analysis using integrated geoscience, engineering and geostatistical methods. As the petroleum industry is heading towards operating oil fields digitally, a multidisciplinary skillset is a must for geoscientists who need to use data analytics to resolve inconsistencies in various sources of data, model reservoir properties, evaluate uncertainties, and quantify risk for decision making. This book intends to serve as a bridge for advancing the multidisciplinary integration for digital fields. The goal is to move beyond using quantitative methods individually to an integrated descriptive-quantitative analysis. In

big data, everything tells us something, but nothing tells us everything. This book emphasizes the integrated, multidisciplinary solutions for practical problems in resource evaluation and field development.

Forging New Frontiers: Fuzzy Pioneers II

Big Data Analytics for Cyber-Physical Systems

Exploration and Development

Seismic Reservoir Characterization

A Practitioner's Guide

Chapter 6. Reservoir Characterization

An accessible guide to using the rock physics-based forward modeling approach for seismic subsurface mapping, for researchers and petroleum geologists.

This book highlights research and survey articles dedicated to big data techniques for cyber-physical system (CPS), which addresses the close interactions and feedback controls between cyber components and physical components. The book first discusses some fundamental big data problems and solutions in large scale distributed CPSs. The book then addresses the design and control challenges in multiple CPS domains such as vehicular system, smart city, smart building, and digital microfluidic biochips. This book also presents the recent advances and trends in the maritime simulation system and the flood defence system.

Reservoir characterization is one of the most important problems in petroleum engineering. It involves forward reservoir modeling that predicts the fluid behavior in the reservoir and inverse problem that calibrates created reservoir models with given data. In this dissertation, we focus on two problems in the field of reservoir characterization: depth of investigation in heterogeneous reservoirs, and history matching and uncertainty quantification of channelized reservoirs. The concept of depth of investigation is fundamental to well test analysis. Much of the current well test analysis relies on analytical solutions based on homogeneous or layered reservoirs. However, such analytic solutions are severely limited for heterogeneous and fractured reservoirs, particularly for unconventional reservoirs with multistage hydraulic fractures. We first generalize the concept to heterogeneous reservoirs and provide an efficient tool to calculate drainage volume using fast marching methods and estimate pressure depletion based on geometric pressure approximation. The applicability of proposed method is illustrated using two applications in unconventional reservoirs including flow regime visualization and stimulated reservoir volume estimation. Due to high permeability contrast and non-Gaussianity of channelized permeability field, it is difficult to history match and quantify uncertainty of channelized reservoirs using traditional approaches. We treat facies boundaries as level set functions and solve the moving boundary problem (history matching) with the level set equation. In addition to level set methods, we also exploit the problem using pixel based approach. The reversible jump Markov Chain Monte Carlo approach is utilized to search the parameter space with flexible dimensions. Both proposed approaches are demonstrated with two and three dimensional examples.

Modeling Uncertainty in the Earth Sciences highlights the various issues, techniques and practical modeling tools available for modeling the uncertainty of complex Earth systems and the impact that it has on practical situations. The aim of the book is to provide an introductory overview which covers a broad range of tried-and-tested tools. Descriptions of concepts, philosophies, challenges, methodologies and workflows give the reader an understanding of the best way to make decisions under uncertainty for Earth Science problems. The book covers key issues such as: Spatial and time aspect; large complexity and dimensionality; computation power; costs of 'engineering' the Earth; uncertainty in the modeling and decision process. Focusing on reliable and practical methods this book provides an invaluable primer for the complex area of decision making with uncertainty in the Earth Sciences.

Decision Analysis for Petroleum Exploration

An Earth Modelling Perspective

WSP Methods in Water Resources Evaluation Series No. 5

The use of Advanced Interpretation Models

A Practical Guide for the Petroleum Geosciences

Unconventional Oil and Gas Resources Handbook

RESERVOIR CHARACTERIZATION FUNDAMENTALS AND APPLICATIONS The second volume in the series, “Sustainable Energy Engineering,” written by some of the foremost authorities in the world on reservoir engineering, this groundbreaking new volume presents the most comprehensive and updated new processes, equipment, and practical applications in the field. Long thought of as not being “sustainable,” newly discovered sources of petroleum and newly developed methods for petroleum extraction have made it clear that not only can the petroleum industry march toward

sustainability, but it can be made “greener” and more environmentally friendly. Sustainable energy engineering is where the technical, economic, and environmental aspects of energy production intersect and affect each other. This collection of papers covers the strategic and economic implications of methods used to characterize petroleum reservoirs. Born out of the journal by the same name, formerly published by Scrivener Publishing, most of the articles in this volume have been updated, and there are some new additions, as well, to keep the engineer abreast of any updates and new methods in the industry. Truly a snapshot of the state of the art, this groundbreaking volume is a must-have for any petroleum engineer working in the field, environmental engineers, petroleum engineering students, and any other engineer or scientist working with reservoirs. This outstanding new volume: Is a collection of papers on reservoir characterization written by world-renowned engineers and scientists and presents them here, in one volume Contains in-depth coverage of not just the fundamentals of reservoir characterization, but the anomalies and challenges, set in application-based, real-world situations Covers reservoir characterization for the engineer to be able to solve daily problems on the job, whether in the field or in the office Deconstructs myths that are prevalent and deeply rooted in the industry and reconstructs logical solutions Is a valuable resource for the veteran engineer, new hire, or petroleum engineering student

This book gathers selected papers from the 8th International Field Exploration and Development Conference (IFEDC 2018) and addresses a broad range of topics, including: Reservoir Surveillance and Management, Reservoir Evaluation and Dynamic Description, Reservoir Production Stimulation and EOR, Ultra-Tight Reservoirs, Unconventional Oil and Gas Resources Technology, Oil and Gas Well Production Testing, and Geomechanics. In brief, the papers introduce readers to upstream technologies used in oil & gas development, the main principles of the process, and various related design technologies. The conference not only provided a platform to exchange experiences, but also promoted the advancement of scientific research in oil & gas exploration and production. The book is chiefly intended for industry experts, professors, researchers, senior engineers, and enterprise managers.

In the middle of the 20th century, Genrich Altshuller, a Russian engineer, analysed hundreds of thousands of patents and scientific publications. From this analysis, he developed TRIZ (G. Altshuller, "40 Principles: TRIZ Keys to Technical Innovation. TRIZ Tools," Volume 1, First Edition, Technical Innovation Center, Inc. , Worcester, MA, January 1998; Y. Salamatov, "TRIZ: The Right Solution at the Right Time. A Guide to Innovative Problem Solving. " Insytec B. V. , 1999), the theory of inventive problem solving, together with a series of practical tools for helping engineers solving technical problems. Among these tools and theories, the substance-field theory gives a structured way of representing problems, the patterns of evolution show the lifecycle of technical systems, the contradiction matrix tells you how to resolve technical contradictions, using the forty principles that describe common ways of improving technical systems. For example, if you want to increase the strength of a device, without adding too much extra weight to it, the contradiction matrix tells you that you can use "Principle 1: Segmentation," or "Principle 8: Counterweight," or "Principle 15: Dynamicity," or "Principle 40: Composite Materials. " I really like two particular ones: "Principle 1: Segmentation," and Principle 15: Dynamicity. " "Segmentation" shows how systems evolve from an initial monolithic form into a set of independent parts, then eventually increasing the number of parts until each part becomes small enough that it cannot be identified anymore.

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