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Petroleum Reservoir Simulation - Husam Yaghi 2013
In this book, the author presents a detailed complex mathematical and computational model for the simulation of fluid flow in reservoirs. The research was conducted in collaboration with Dr. John M. Tyler of LSU and was funded by the United States Department of Energy. The results were published in a Ph.D. dissertation and at several international conferences. Oil and Gas Reservoirs Hydrocarbons and their associated impurities occur in rock formations that are usually buried thousands of feet or meters below the surface. Scientists and engineers often call rock formations that hold hydrocarbons "reservoirs." Oil does not flow in underground rivers or pool up in subterranean lakes, contrary to what some people think. crude oil and natural gas occur in buried rocks and, once produced from a well, companies have to refine the crude oil and process the natural gas into useful products. Further, not every rock can hold hydrocarbons. To serve as an oil and gas reservoir, rocks have to meet several criteria.

Encyclopedia of Applied and Computational Mathematics - Björn Engquist 2016-12-16
EACM is a comprehensive reference work covering the vast field of applied and computational mathematics. Applied mathematics itself accounts for at least 60 per cent of mathematics, and the emphasis on computation reflects the current and constantly growing importance of computational methods in all areas of applications. EACM emphasizes the strong links of applied mathematics with major areas of science, such as physics, chemistry, biology, and computer science, as well as specific fields like atmospheric ocean science. In addition, the mathematical input to modern engineering and technology form another core component of EACM.

Handbook of Geomathematics - Willi Freeden 2010-08-13
During the last three decades geosciences and geo-engineering were influenced by two essential scenarios: First, the technological progress has changed completely the observational and measurement techniques. Modern high speed computers and satellite based techniques are entering more and more all geodisciplines. Second, there is a growing public concern about the future of our planet, its climate, its environment, and about an expected shortage of natural resources. Obviously, both aspects, viz. efficient strategies of protection against threats of a changing Earth and the exceptional situation of getting terrestrial, airborne as well as spaceborne data of better and better quality explain the strong need of new mathematical structures, tools, and methods. Mathematics concerned with geoscientific problems, i.e., Geomathematics, is becoming increasingly important. The ‘Handbook Geomathematics’ as a central reference work in this area comprises the following scientific fields: (I) observational and measurement key technologies (II) modelling of the system Earth (geosphere, cryosphere, hydrosphere, atmosphere, biosphere) (III) analytic, algebraic, and operator-theoretic methods (IV) statistical and stochastic methods (V) computational and numerical analysis methods (VI) historical background and future perspectives.

Summary Report from Workshop on Two-Dimensional Mathematical Models for Use in Hydraulic Problems - Frank D. Masch 1977
American highway organizations are constantly faced with complex problems regarding stream crossings with the more challenging situations lying in low gradient streams common in the southeastern United States. Conventional and empirical one-dimensional methods are sometimes found to be inadequate and may eventually be supplanted by more sophisticated two-dimensional analytical methods. The subject workshop was conducted in order to consolidate ideas and opinions covering the feasibility of future development of two-dimensional mathematical models as might be applied to hydraulic problems.

Mathematical Models and Finite Elements for Reservoir Simulation - Guy Chavent 1986
Numerical simulators for oil reservoirs have been developed over the last twenty years and are now widely used by oil companies. The research, however, has taken place largely within the industry itself, and has remained somewhat inaccessible to the scientific community. This book hopes to remedy the situation by means of its synthesized presentation of the models used in reservoir simulation, in a form understandable to both mathematicians and engineers. The book aims to initiate a rigorous mathematical study of the immiscible flow models, partly by using the novel `global pressure' approach in treating incompressible two-phase problems. A finite element approximation technique based on the global pressure variational model is presented, and new approaches to the modelling of various kinds of multiphase flow through porous media are introduced. Much of the material is highly original, and has not been presented elsewhere. The mathematical and numerical models should be of great interest to applied mathematicians, and to engineers seeking an alternative approach to reservoir modelling.--[Source inconnue].

Reservoir Simulations - Shuyu Sun 2020-06-18
Reservoir Simulation: Machine Learning and Modeling helps the engineer step into the current and most popular advances in reservoir simulation, learning from current experiments and speeding up potential collaboration opportunities in research and technology. This reference explains common terminology, concepts, and equations through multiple figures and rigorous derivations, better preparing the engineer for the next step forward in a modeling project and avoid repeating existing progress. Well-designed exercises, case studies and numerical examples give the engineer a faster start on advancing their own cases. Both computational methods and engineering cases are explained, bridging the opportunities between computational science and petroleum engineering. This book delivers a critical reference for today’s petroleum and reservoir engineer to optimize more complex developments. Understand commonly used and recent progress on definitions, models, and solution methods used in reservoir simulation World leading modeling and algorithms to study flow and transport behaviors in reservoirs, as well as the application of machine learning Gain practical knowledge with hand-on trainings on modeling and simulation through well designed case studies and numerical examples.

NBS Special Publication - 1980

Dams and Reservoirs in Evaporites - Petar Milanović 2019-05-25
This book shares essential insights on evaporites and their effects on dams and reservoirs. The intensity of the solution and suffusion process in evaporites (gypsum and salt) is much greater than the solution of carbonates, and evaporites are particularly vulnerable at dam and reservoir sites. Moreover, the presence of evaporites in the vicinity of dams or reservoirs often leads to serious problems: numerous dams in countries around the world (e.g. China, Germany, Iran, Iraq, Peru, Russia, Spain, the Unites States, and Venezuela) have been affected by

evaporite dissolution problems. Several of these dams were seriously endangered or ultimately abandoned, even though the best available engineering prevention and remediation practices were applied. Conventional geotechnical methods based on treating the underground (e.g. grout curtains) or surface (e.g. protective blankets) were not successful. This book presents and analyzes revealing case studies in this regard. To improve geotechnical remediation in connection with preventing seepage from reservoirs situated in evaporites, particularly in gypsum, it puts forward a new chemical solution that, after painstaking laboratory testing, was successfully applied in the field.

Embedded Discrete Fracture Modeling and Application in Reservoir Simulation - Kamy Sepehrnoori 2020-08-27

The development of naturally fractured reservoirs, especially shale gas and tight oil reservoirs, exploded in recent years due to advanced drilling and fracturing techniques. However, complex fracture geometries such as irregular fracture networks and non-planar fractures are often generated, especially in the presence of natural fractures. Accurate modelling of production from reservoirs with such geometries is challenging. Therefore, Embedded Discrete Fracture Modeling and Application in Reservoir Simulation demonstrates how production from reservoirs with complex fracture geometries can be modelled efficiently and effectively. This volume presents a conventional numerical model to handle simple and complex fractures using local grid refinement (LGR) and unstructured gridding. Moreover, it introduces an Embedded Discrete Fracture Model (EDFM) to efficiently deal with complex fractures by dividing the fractures into segments using matrix cell boundaries and creating non-neighboring connections (NNCs). A basic EDFM approach using Cartesian grids and advanced EDFM approach using Corner point and unstructured grids will be covered. Embedded Discrete Fracture Modeling and Application in Reservoir Simulation is an essential reference for anyone interested in performing reservoir simulation of conventional and unconventional fractured reservoirs. Highlights the current state-of-the-art in reservoir simulation of unconventional reservoirs Offers understanding of the impacts of key reservoir properties and complex fractures on well performance Provides case studies to show how to use the EDFM method for different needs

Development of Generalized Free Surface Flow Models Using Finite Element Techniques - D. Michael Gee 1978

Two finite element hydrodynamic models, one for two-dimensional free surface flow in the horizontal plane and one for the vertical plane are being evaluated. Although the models are formulated to solve dynamic flow problems, all work to date has been with steady state solutions. Recent research has focused on mass continuity performance of the models, proper boundary condition specification, and comparison with finite difference techniques. The objective of this research is to develop generalized mathematical models for routine use by the engineering community. This paper presents recent results of evaluation and application of the models. (Author).

Hydraulic Research in the United States and Canada, 1978 - Pauline H. Gurewitz 1980

Fractured Vuggy Carbonate Reservoir Simulation - Jun Yao 2017-08-08

This book solves the open problems in fluid flow modeling through the fractured vuggy carbonate reservoirs. Fractured vuggy carbonate reservoirs usually have complex pore structures, which contain not only matrix and fractures but also the vugs and cavities. Since the vugs and cavities are irregular in shape and vary in diameter from millimeters to meters, modeling fluid flow through fractured vuggy porous media is still a challenge. The existing modeling theory and methods are not suitable for such reservoir. It starts from the concept of discrete fracture and fracture-vug networks model, and then develops the corresponding mathematical models and numerical methods, including discrete fracture model, discrete fracture-vug model, hybrid model and multiscale models. Based on these discrete porous media models, some equivalent medium models and methods are also discussed. All the modeling and methods shared in this book offer the key recent solutions into this area.

Reservoir Engineering Models: Analytical and Numerical Approaches - Luis F. Ayala 2018-11-01

Publisher's Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. Develop, build, and deploy accurate mathematical models for hydrocarbon reservoirs This practical resource discusses the construction of reservoir models and the implementation of these models in both forward and inverse modes using numerical, analytical, empirical, and artificial intelligence techniques. Written by a pair of experts in the field, Reservoir Engineering Models: Analytical and Numerical Approaches clearly explains the complicated building processes of mathematical models and lays out cutting-edge solution protocols. Advanced chapters teach the assembly of complex physical processes using principles of physics, thermodynamics and mathematics. You will learn to optimize decision-making processes applicable to the management of field development and extraction activities. Coverage includes: •An introduction to reservoir engineering models•Mathematics of reservoir engineering•Reservoir engineering fundamentals•Hydrocarbon fluid models and thermodynamics•Reservoir engineering transport equations•Analytical and numerical reservoir engineering solutions•Proxy and hybrid models in reservoir engineering

Proceedings of the International Field Exploration and Development Conference 2019 - Jia'en Lin 2020-07-11

This book gathers selected papers from the 8th International Field Exploration and Development Conference (IFEDC 2019) and addresses a broad range of topics, including: Low Permeability Reservoir, Unconventional Tight & Shale Oil Reservoir, Unconventional Heavy Oil and Coal Bed Gas, Digital and Intelligent Oilfield, Reservoir Dynamic Analysis, Oil and Gas Reservoir Surveillance and Management, Oil and Gas Reservoir Evaluation and Modeling, Drilling and Production Operation, Enhancement of Recovery, Oil and Gas Reservoir Exploration. 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.

Mathematical Modelling of Sediment Transport and Deposition in Reservoirs - Guidelines and Case Studies / Modélisation Mathématique du Transport et des Dépôts de Sédiments dans les Réservoirs - Lignes Directrices et Études de Cas - Cigb Icold 2021-06-27

As reservoir sedimentation has proven to be a serious problem in South Africa, research in this field has been ongoing for more than 70 years. This publication emanates from extensive research which has been undertaken over the past 30 years with the support of the South African Department of Water and Sanitation as well as the South African Water Research Commission. A great deal of information has fortunately also been obtained from China. Given the universal nature of hydraulic formulae it is not surprising, yet gratifying, that Chinese and South African data generally conform to the same mathematical relationships. This indicates that these relationships should be applicable in other countries as well. Much of the information contained here has been condensed from a more comprehensive publication. This ICOLD Bulletin follows on Bulletin 115 “Dealing with reservoir sedimentation”, which gave guidelines for management of reservoirs to limit sedimentation. The guidelines on mathematical modelling of sediment transport dynamics in reservoirs in this document can be used during the planning and design of new dams, as well as for the management of existing dams. Comme la sédimentation dans les réservoirs s'est avérée être un problème sérieux en Afrique du Sud, la recherche dans ce domaine est en cours depuis plus de 70 ans. Cette publication émane de la recherche étendue qui a été menée au cours des 30 dernières années avec l'appui du ministère sud-africain de l’eau et de l’assainissement, ainsi que de la commission sud-africaine de recherche sur l'eau. Un grand nombre d'informations ont également été obtenues de la part de la Chine. Étant donné le caractère universel de formules hydrauliques, il n'est pas surprenant, mais très gratifiant, que les données chinoises et sud-africaines se conforment généralement aux mêmes relations mathématiques. Ceci indique que ces relations devraient être applicables dans d'autres pays également. Une grande partie de l'information contenue ici a été condensée à partir d'une publication plus complète. Ce bulletin CIGB fait suite au bulletin 115 "Traité sur la sédimentation dans les réservoirs", qui a donné des directives pour la gestion des réservoirs en vue de limiter la sédimentation. Les directives sur la modélisation mathématique de la dynamique de transport des sédiments dans les réservoirs de ce présent document peuvent être utilisées lors de la planification et la conception de nouveaux barrages et pour la gestion des barrages existants.

Geometric Modelling, Numerical Simulation, and Optimization: - Geir Hasle 2007-06-10

This edited volume addresses the importance of mathematics for industry and society by presenting highlights from contract research at the Department of Applied Mathematics at SINTEF, the largest independent research organization in Scandinavia. Examples range from computer-aided geometric design, via general purpose computing on graphics

cards, to reservoir simulation for enhanced oil recovery. Contributions are written in a tutorial style.
Proceedings - 1993

Selected Water Resources Abstracts - 1991

Hydraulic Research in the United States and Canada, 1972 - Gershon Kulin 1974

Multiscale Modeling and Simulation in Science - Björn Engquist 2009-02-11
Most problems in science involve many scales in time and space. An example is turbulent ?ow where the important large scale quantities of lift and drag of a wing depend on the behavior of the small vortices in the boundarylayer. Another example is chemical reactions with concentrations of the species varying over seconds and hours while the time scale of the oscillations of the chemical bonds is of the order of femtoseconds. A third example from structural mechanics is the stress and strain in a solid beam which is well described by macroscopic equations but at the tip of a crack modeling details on a microscale are needed. A common dif?culty with the simulation of these problems and many others in physics, chemistry and biology is that an attempt to represent all scales will lead to an enormous computational problem with unacceptably long computation times and large memory requirements. On the other hand, if the discretization at a coarse level ignoresthe?nescale informationthenthesolutionwillnotbephysicallymeaningful. The in?uence of the ?ne scales must be incorporated into the model. This volume is the result of a Summer School on Multiscale Modeling and S- ulation in Science held at Boso ¤n, Lidingo ¤ outside Stockholm, Sweden, in June 2007. Sixty PhD students from applied mathematics, the sciences and engineering parti- pated in the summer school.
Hydraulic Research in the United States and Canada - United States. National Bureau of Standards 1978

Well Production Performance Analysis for Shale Gas Reservoirs - Liehui Zhang 2019-05-16
Well Production Performance Analysis for Shale Gas Reservoirs, Volume 66 presents tactics and discussions that are urgently needed by the petroleum community regarding unconventional oil and gas resources development and production. The book breaks down the mechanics of shale gas reservoirs and the use of mathematical models to analyze their performance. Features an in-depth analysis of shale gas horizontal fractured wells and how they differ from their conventional counterparts Includes detailed information on the testing of fractured horizontal wells before and after fracturing Offers in-depth analysis of numerical simulation and the importance of this tool for the development of shale gas reservoirs
Advances in Fluid Modeling and Turbulence Measurements -

Proceedings ... SPE Annual Technical Conference and Exhibition - Society of Petroleum Engineers (U.S.). Technical Conference and Exhibition 1995

Advances in Fluid Modeling & Turbulence Measurements - Akira Wada 2002
This book is an essential reference for engineers and scientists working in the field of turbulence. It covers a variety of applications, such as: turbulence measurements; mathematical and numerical modeling of turbulence; thermal hydraulics; applications for civil, mechanical and nuclear engineering; environmental fluid mechanics; river and open channel flows; coastal problems; ground water.
An Introduction to Reservoir Simulation Using MATLAB/GNU Octave - Knut-Andreas Lie 2019-06-30
This book provides a self-contained introduction to the simulation of flow and transport in porous media, written by a developer of numerical methods. The reader will learn how to implement reservoir simulation models and computational algorithms in a robust and efficient manner. The book contains a large number of numerical examples, all fully equipped with online code and data, allowing the reader to reproduce results, and use them as a starting point for their own work. All of the examples in the book are based on the MATLAB Reservoir Simulation Toolbox (MRST), an open-source toolbox popular popularity in both academic institutions and the petroleum industry. The book can also be seen as a user guide to the MRST software. It will prove invaluable for researchers, professionals and advanced students using reservoir simulation methods. This title is also available as Open Access on Cambridge Core.
Selected Water Resources Abstracts - 1991

Energy Research Abstracts - 1994-05

Hydraulic Research in the United States and Canada, 1974 - Pauline H. Gurewitz 1976

Geothermal Energy Update - 1978-12

SIAM Journal on Scientific Computing - 1999

Computation and Applied Mathematics - 1998

Computational Methods in Subsurface Flow - Peter S. Huyakorn 2012-12-02
Computational Methods in Subsurface Flow explores the application of all of the commonly encountered computational methods to subsurface problems. Among the problems considered in this book are groundwater flow and contaminant transport; moisture movement in variably saturated soils; land subsidence and similar flow and deformation processes in soil and rock mechanics; and oil and geothermal reservoir engineering. This book is organized into 10 chapters and begins with an introduction to partial differential and various solution approaches used in subsurface flow. The discussion then shifts to the fundamental theory of the finite element method, with emphasis on the Galerkin finite element method and how it can be used to solve a wide range of subsurface problems. The subjects treated range from simple problems of saturated groundwater flow to more complex ones of moisture movement and multiphase flow in petroleum reservoirs. The chapters that follow focus on fluid flow and mechanical deformation of conventional and fractured porous media; point and subdomain collocation techniques and the boundary element technique; and the applications of finite difference techniques to single- and multiphase flow and solute transport. The final chapter is devoted to other alternative numerical methods that are based on combinations of the standard finite difference approach and classical mathematics. This book is intended for senior undergraduate and graduate students in geoscience and engineering, as well as for professional groundwater hydrologists, engineers, and research scientists who want to solve or model subsurface problems using numerical techniques.
Hydraulic Research in the United States and Canada, 1976 - Pauline H. Gurewitz 1978

Computation and Applied Mathematics - 1995

NBS Special Publication - 1980

Fluid Flow and Transport in Porous Media, Mathematical and Numerical Treatment - Zhangxin Chen 2002
This volume contains research papers written and edited by prominent researchers working with the mathematical and numerical treatment of fluid flow and transport in porous media. The papers are based on talks given at a 2001 Joint AMS-IMS-SIAM Summer Research Conference held at Mount Holyoke College (South Hadley, MA). The topics cover a variety of subjects such as network flow modeling, contemporary numerical methods, parallel computation, optimization, multiscale phenomena, upscaling, uncertainty reduction, well treatment, and media characterization. The material addresses many problems originating from the applied geosciences and focuses on their common state-of-the-art mathematical and numerical treatment. This work is particularly pertinent to those working in oil exploration and other industrial applications. The book serves as an excellent reference work for all geoscientists, mathematicians, physicists, and engineers working in this research area.
The Mathematics of Reservoir Simulation - Richard E. Ewing 1983-01-01
The emergence of complex enhanced recovery procedures in the field of hydrocarbon extraction techniques has emphasized the need for sophisticated mathematical tools, capable of modeling intricate chemical and physical phenomena and sharply changing fluid interfaces. This volume explains which problems need to be addressed, why they are difficult, what has been done previously to treat these difficulties, and which new techniques appear to possess potential for obtaining good

simulation results.

Mathematical Modeling for Flow and Transport Through Porous Media - Gedeon Dagan 2013-06-29

The main aim of this paper is to present some new and general results, ap plicable to the the equations of two phase flow, as formulated in geothermal reservoir engineering. Two phase regions are important in many geothermal reservoirs, especially at depths of order several hundred metres, where ris ing, essentially isothermal single phase liquid first begins to boil. The fluid then continues to rise, with its temperature and pressure closely following the saturation (boiling) curve appropriate to the fluid composition. Perhaps the two most interesting theoretical aspects of the (idealised) two phase flow equations in geothermal reservoir engineering are that firstly, only one component (water) is involved; and secondly, that the densities of the two phases are so different. This has led to the approximation of ignoring capillary pressure. The main aim of this paper is to analyse some of the consequences of this assumption, especially in relation to saturation changes within a uniform porous medium. A general analytic treatment of three dimensional flow is considered. Pre viously, three dimensional modelling in geothermal reservoirs have relied on numerical simulators. In contrast, most of the past analytic work has been restricted to one dimensional examples.

Mathematical Models and Finite Elements for Reservoir Simulation - G. Chavent 1986-01-01

Numerical simulators for oil reservoirs have been developed over the last twenty years and are now widely used by oil companies. The research, however, has taken place largely within the industry itself, and has remained somewhat inaccessible to the scientific community. This book hopes to remedy the situation by means of its synthesized presentation of the models used in reservoir simulation, in a form understandable to both mathematicians and engineers. The book aims to initiate a rigorous mathematical study of the immiscible flow models, partly by using the novel `global pressure' approach in treating incompressible two-phase problems. A finite element approximation technique based on the global pressure variational model is presented, and new approaches to the modelling of various kinds of multiphase flow through porous media are introduced. Much of the material is highly original, and has not been presented elsewhere. The mathematical and numerical models should be of great interest to applied mathematicians, and to engineers seeking an alternative approach to reservoir modelling.