3d Geomechanical Modeling Of Complex Salt Structures

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Reservoir Geomechanics Springer Nature
This book is Volume 2 of the EUROCK 2018 proceedings. Geomechanics and Geodynamics of Rock Masses contains contributions presented at EUROCK 2018, the 2018 International Symposium of the International Society for Rock Mechanics (ISRM 2018, Saint Petersburg, Russia, 22-26 May 2018). Dedicated to recent advances and achievements in the fields of geomechanics and geotechnology, the main topics of the book include: - Physical and mechanical properties of fractured rock (laboratory testing and rock properties, field measurements and site investigations) - Geophysics in rock mechanics - Rock mass strength and failure - Nonlinear problems in rock mechanics - Effect of joint water on the behavior of rock foundation - Numerical modeling and back analysis - Mineral resources development: methods and rock mechanics problems - Rock mechanics and underground construction in mining, hydropower industry and civil engineering - Rock mechanics in petroleum engineering - Geodynamics and monitoring of rock mass behavior - Risks and hazards - Geomechanics of technogenic deposits Geomechanics and Geodynamics of Rock Masses will be of interest to researchers and professionals involved in the various branches of rock mechanics and rock engineering. EUROCK 2018, organized by the Saint Petersburg Mining University, is a continuation of the successful series of ISRM symposia in Europe, which began in 1992 in Chester, UK.
Geomechanics and Geodynamics of Rock Masses, Volume 1 Structurally Complex Reservoirs Man’s intensifying use of the Earth’s habitat has led to an urgent need for scientifically advanced ‘geo-prediction systems’ that accurately locate subsurface resources and forecast the timing and magnitude of earthquakes, volcanic eruptions and land subsidence. As advances in the earth sciences lead to process-oriented ways of modeling the complex processes in the solid Earth, the papers in this volume provide a survey of some recent developments at the leading edge of this highly technical discipline. The chapters cover current research in predicting the future behavior of geologic systems as well as the mapping of geologic patterns that exist now in the subsurface as frozen evidence of the past. Both techniques are highly relevant to humanity’s need for resources such as water, and will also help us control environmental degradation. The book also discusses advances made in seismological methods to obtain information on the 3D structure of the mantle and the lithosphere, and in the quantitative understanding of lithospheric scale processes. It covers recent breakthroughs in 3D seismic imaging that have enhanced the spatial resolution of these structural processes, and the move towards 4D imaging that measures these processes over time. The new frontier in modern Earth sciences described in this book has major implications for oceanographic and atmospheric sciences and our understanding of climate variability. It brings readers right up to date with the research in this vital field.
Geomechanics and Geodynamics of Rock Masses CRC Press
This volume reviews our current understanding and ability to model the complex distribution and behaviour of fault and fracture networks, highlighting their fluid compartmentalizing effects and storage-transmissivity characteristics, and outlining approaches for predicting the dynamic fluid flow and geomechanical behaviour of these reservoirs. This collection of 25 papers provides an overview of recent progress and outstanding issues in the areas of structural complexity and fault geometry, detection and prediction of faults and fractures, compartmentalizing effects of fault systems and complex siliciclastic reservoirs and critical controls affecting fractured reservoirs.

Numerical Simulation in Hydraulic Fracturing: Multiphysics Theory and Applications Editions TECHNIP
The expansion of unconventional petroleum resources in the recent decade and the rapid development of computational technology have provided the opportunity to develop and apply 3D numerical modeling technology to simulate the hydraulic fracturing of shale and tight sand formations. This book presents 3D numerical modeling technologies for hydraulic fracturing developed in recent years, and introduces solutions to various 3D geomechanical problems related to hydraulic fracturing. In the solution processes of the case studies included in the book, fully coupled multi-physics modeling has been adopted, along with innovative computational techniques, such as submodeling. In practice, hydraulic fracturing is an essential project component in shale gas/oil development and tight sand oil, and provides an essential measure in the process of drilling cuttings reinjection (CRI). It is also an essential measure for widened mud weight window (MWW) when drilling through naturally fractured formations; the process of hydraulic plugging is a typical application of hydraulic fracturing. 3D modeling and numerical analysis of hydraulic fracturing is essential for the successful development of tight oil/gas formations: it provides accurate solutions for optimized stage intervals in a multistage fracking job. It also provides optimized well-spacing for the design of zipper-frac wells. Numerical estimation of casing integrity under stimulation injection in the hydraulic fracturing process is one of major concerns in the successful development of unconventional resources. This topic is also investigated numerically in this book. Numerical solutions to several other typical geomechanics problems related to hydraulic fracturing, such as fluid migration caused by fault reactivation and seismic activities, are also presented. This book can be used as a reference textbook to petroleum, geotechnical and geothermal engineers, to senior undergraduate, graduate and postgraduate students, and to geologists, hydrogeologists, geophysicists and applied mathematicians working in this field. This book is also a synthetic compendium of both the fundamentals and some of the most advanced aspects of hydraulic fracturing technology.
North American Tunneling 2022 Proceedings Springer
Engineers and geologists in the petroleum industry will find Petroleum Related Rock Mechanics, 2e, a powerful resource in providing a basis of rock mechanical knowledge - a knowledge which can greatly assist in the understanding of field behavior, design of test programs and the design of field operations. Not only does this text give an introduction to applications of rock mechanics within the petroleum industry, it has a strong focus on basics, drilling, production and reservoir engineering. Assessment of rock mechanical parameters is covered in depth, as is acoustic wave propagation in rocks, with possible link to 4D seismics as well as log interpretation. Learn the basic principles behind rock mechanics from leading academic and industry experts Quick reference and guide for engineers and geologists working in the field Keep informed and up to date on all the latest methods and fundamental concepts
The Evolution of Geotech - 25 Years of Innovation CSIRO PUBLISHING
This book is the second edition of the well-known textbook Modelling Rock Fracturing Processes. The new and extended edition provides the theoretical background of rock fracture mechanics used for modelling of 2-D and 3-D geomechanics problems and processes. Fundamentals of rock fracture mechanics integrated with experimental studies of rock fracturing processes are highlighted. The computer programs FRACOD 2D and 3D are used to analyse fracture initiation and propagation for the three fracture modes: Mode I, II and III. Coupled fracture modelling with other continuous and distinct element codes including FLAC, PFC, RFPA, TOUGH are also described. A series of applications of fracture modelling with importance for modern society is presented and discussed by distinguished rock fracture modelling experts.
Modelling Rock Fracturing Processes Gulf Professional Publishing
Structurally Complex ReservoirsGeological Society of London
Finite Elements in Civil Engineering Applications Cuvillier Verlag
Different applications of linear elasticity in structural geology are presented in this thesis through the development of three types of numerical computer codes. The first one uses forward modeling to study displacement and perturbed stress fields around complexly faulted regions. We show that incorporating inequality constraints, such as static Coulomb friction, enables one to explain the angle of initiation of jogs in extensional relays. Adding heterogeneous material properties and optimizations, such as parallelization on multicore architectures and complexity reduction, admits more complex models. The second type deals with inverse modeling, also called parameter estimation. Linear slip inversion on faults with complex geometry, as well as paleo-stress inversion using a geomechanical approach, are developed. The last type of numerical computer code is dedicated to restoration of complexly folded and faulted structures. It is shown that this technique enables one to check balanced cross-sections, and also to retrieve fault chronology. Finally, we show that this code allows one to smooth noisy 3D interpreted faulted and folded horizons using geomechanics.
Geomechanics in Reservoir Simulation Blucher Open Access
This publication includes 82 technical papers presented at Rocscience International Conference (RIC) 2021, held online on April 20 and 21, 2021. Rocscience created this event to bring geotechnical academics, researchers and practitioners together to exchange ideas as part of celebrating 25 years of the company's existence. The papers in these proceedings were from keynotes, panel discussions and papers, selected after careful review of over 100 technical submissions delivered at RIC 2021. The technical papers were grouped into sessions based on their subject areas. The conference aimed to stimulate discussions that could help the industry work towards overcoming geotechnical engineering limitations today. It also sought to foster creative thinking that will advance the current states of the art and practice. The keynote addresses, panel discussions and technical presentations tried to examine geotechnical problems and situations from fresh perspectives. RIC 2021 hopes that the proceedings will continue to enrich our thinking and contribute to achieving a critical mass of change in our practices and approaches. We look forward to significant improvements in our industry.
Perspectives to CO2 Geological Storage and Greenhouse Gas Negative Emissions in South-Southeastern Brazil Editions TECHNIP
Hydraulic fracturing in tight gas and shale gas reservoirs is an essential stimulation technique for production enhancement. Often, hydraulic fracturing induces fracture patterns that are more complex than the planar geometry that has been assumed in the past models. These complex patterns arise as a result of the presence of planes of weakness, faults and/or natural fractures. In this thesis, two different 3D geomechanical models have been developed to simulate the interaction between the hydraulic fracture and the natural fractures, and to observe the impact of geomechanics on the potential microseismicity in these naturally fractured formations. Several cases were studied to observe the effects of natural fracture geometry, fracturing treatment, mechanical properties of the sealed fractures, etc. on the propagation path of the hydraulic fracture in these formations, and were found to be consistent with past experimental results. Moreover, the effects of several parameters including cohesiveness of the sealed natural fractures, mechanical properties of the formation, treatment parameters, etc. have been studied from the potential microseismicity standpoint. It is shown that the impact of geomechanics on potential microseismicity is significant and can influence the desired fracture spacing. In this thesis, the presented model quantifies the extent of potential microseismic volume (MSV) resulting from hydraulic fracturing in unconventional reservoirs. The model accounts for random geometries of the weak planes (with different dip and strike) observed in the field. The work presented here shows, for the first time, a fracture treatment can be designed to maximize the MSV, when the fractures form a complicated network of fractures, and in turn influence the desired fracture spacing in horizontal wells. Our work shows that by adjusting the fluid rheology and other treatment parameters, the spatial extent of MSV and the desired fracture spacing can be optimized for a given set of shale properties.
Hydraulic Fracturing in Naturally Fractured Reservoirs and the Impact of Geomechanics on Microseismicity Springer Science & Business Media
The papers in this volume reflect the current research and advances made in the application of numerical methods in geotechnical engineering. Topics include: instabilities in soil behaviour; environmental geomechanics; and hydro-mechanical coupling in problems of engineering.
Petroleum Geoscience Geological Society of London
Rocks and soils can behave as discontinuous materials, both physically and mechanically, and for such discontinuous nature and behaviour there remain challenges in numerical modelling methods and techniques. Some of the main discontinuum based numerical methods, for example the distinct element method (DEM) and the discontinuous deformation analysi
Challenges and Innovations in Geomechanics Gulf Professional Publishing
The superior goal of the gebo research association was making important contributions for the future reliable drilling under the existing "hot-hard-rock" conditions in Niedersachsen and their development to the geothermal drillings with sustainable geological subsurface heat exchangers. This goal should be achieved due to the solid research and innovative technology approaches in their combination within one concept for pioneering methods in deep geothermal drillings in hard rock, to be more exact - in interdisciplinary cooperation on engineers and scientists - in cooperation between industry and University, researchers and users Gebo research association comprised scientists and technicians of different research institutions and universities who are working in 33 projects. The individual projects were assigned to one of the 4 main research fields or focus areas. Gebo research association started its activities with 7 project partners participating: - Technische Universität Braunschweig (TUBS) - Technische Universität Clausthal (TUC) - Gottfried Wilhelm Leibniz Universität Hannover (LUH) - Georg-August-Universität Göttingen (UGOE) - Leibniz-Institut für Angewandte Geophysik (LIAG) - Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) - Energie-Forschungszentrum Niedersachsen (EFZN) Baker Hughes, an industrial partner, participated in the association and supplies it with its experience and additional funds.
Mechanical Behaviour of Salt VIII CRC Press
Technical contributions contained in this volume characterize continuity of science, engineering and modeling regarding the mechanical behavior of salt. These papers evidence relationships from microscopic dislocation structure to modeling applications over kilometer dimensions, a reach of more than ten orders of magnitude. The book is arranged alo
CRC Press
This book presents the latest studies of the CNPq Research Group (Estudos para Armazenamento Geológico de Carbono – CCS) of the Institute of Energy and Environment/Research Centre for Greenhouse Gas Innovation, at the University of Sao Paulo. The studies are related to the technical and regulatory issues for implementing Carbon, Capture and Storage (CCS) technologies, especially CO2 geological storage in the Paraná and Santos Basins. The parent project, entitled "Carbon Geological Storage in Brazil: "Perspectives for CCS in unconventional petroleum reservoirs of onshore Paraná sedimentary basin and turbidites from offshore sedimentary basins in southeast Brazil", was funded by SHELL and FAPESP. The book intends to provide an overview of the potential for secured long-term CO2 storage in the Paraná and Santos basins with high prospects for CCS. The central academic findings refer to CO2 reservoir properties and main criteria for site selection to improve the Brazilian CCUS development's decision-making process and contribute to the R&D plan for greenhouse gas emissions mitigation of the Southeastern Region, with geological evaluations and regulatory analyses. The book aims to improve the decision-making process in greenhouse gases mitigation and energy/environmental governance; therefore, it captures the specialized and non-specialized audience.
New Frontiers in Integrated Solid Earth Sciences CRC Press
These proceedings present high-level research in structural engineering, concrete mechanics and quasi-brittle materials, including the prime concern of durability requirements and earthquake resistance of structures.
3D, 4D and Predictive Modelling of Major Mineral Belts in Europe Elsevier
Geomechanics and Geodynamics of Rock Masses – Selected Papers contains selected contributions from EUROCK 2018, the 2018 International Symposium of the International Society for Rock Mechanics (ISRM 2018, Saint Petersburg, Russia, 22—26 May 2018). Dedicated to recent advances and achievements in the fields of geomechanics and geotechnology, the book will be of interest to researchers and professionals involved in the various branches of rock mechanics and rock engineering. EUROCK 2018, organized by the Saint Petersburg Mining University, is a continuation of the successful series of ISRM symposia in Europe, which began in 1992 in Chester, UK.
Modeling in Geotechnical Engineering European Assn of Geoscientists&
This book presents the results of the major EU project Promine. For the first time there is now a European database available on mineral deposits, as well as 3D, 4D and predictive models of major mineral belts in Europe: Fennoscandia (Skellefteå and Vihanti-Pyhäsalmi), the Fore-Sudetic basin (Kupferschiefer deposits in Poland and Germany), the Hellenic belt in northern Greece, and the Iberian Pyrite belt and Ossa Morena zone in Spain and Portugal. The book also describes the modelling techniques applied and how different types of software are used for three- and four-dimensional modelling. Furthermore, fundamental descriptions of how to build the database structure of three-dimensional geological data are provided and both 2D and 3D predictive models are presented for the main mineral belts of Europe.
Innovative Numerical Modelling in Geomechanics John Wiley & Sons Incorporated
This book systematically introduces readers to the simulation theory and techniques of multiple media for unconventional tight reservoirs. It summarizes the macro/microscopic heterogeneities; the features of multiscale multiple media; the characteristics of complex fluid properties; the

occurrence state of continental tight oil and gas reservoirs in China; and the complex flow characteristics and coupled production mechanism under unconventional development patterns. It also discusses the simulation theory of multiple media for unconventional tight oil and gas reservoirs; mathematic model of flow through discontinuous multiple media; geological modeling of discrete multiscale multiple media; and the simulation of multiscale, multiphase flow regimes and multiple media. In addition to the practical application of simulation and software for unconventional tight oil and gas, it also explores the development trends and prospects of simulation technology. The book is of interest to scientific researchers and technicians engaged in the development of oil and gas reservoirs, and serves as a reference resource for advanced graduate students in fields related to petroleum.

New Insights Into Structural Interpretation and Modelling Geological Society of London

Hydraulic Fracture Modeling delivers all the pertinent technology and solutions in one product to become the go-to source for petroleum and reservoir engineers. Providing tools and approaches, this multi-contributed reference presents current and upcoming developments for modeling rock fracturing including their limitations and problem-solving applications. Fractures are common in oil and gas reservoir formations, and with the ongoing increase in development of unconventional reservoirs, more petroleum engineers today need to know the latest technology surrounding hydraulic fracturing technology such as fracture rock modeling. There is tremendous research in the area but not all located in one place. Covering two types of modeling technologies, various effective fracturing approaches and model applications for fracturing, the book equips today’s petroleum engineer with an all-inclusive product to characterize and optimize today’s more complex reservoirs. Offers understanding of the details surrounding fracturing and fracture modeling technology, including theories and quantitative methods Provides academic and practical perspective from multiple contributors at the forefront of hydraulic fracturing and rock mechanics Provides today’s petroleum engineer with model validation tools backed by real-world case studies