Discrete Fracture Model For Coupled Flow And Geomechanics

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Nuclear Environments L0430 Hydraulic fracture design and modeling: introduction dfnWorks 3DEC 5.20 Introductory Webinar Introduction to DIANA10 Discrete Fracture Model For Coupled

The Discrete Fracture Model (DFM) has been widely used to model the flow and transport in natural geological porous formations. Here, we extend the DFM approach to model deformation. The flow equations are discretized using a finite-volume method, and the poroelasticity equations are discretized using a Galerkin finite-element approximation.

Discrete fracture model for coupled flow and geomechanics ...

Discrete Fracture Model For Coupled Flow And Geomechanics Author: crafty.roundhouse-designs.com-2020-10-14T00:00:00+00:01 Subject: Discrete Fracture Model For Coupled Flow And Geomechanics Keywords: discrete, fracture, model, for, coupled, flow, and, geomechanics Created Date: 10/14/2020 2:02:37 PM

Discrete Fracture Model For Coupled Flow And Geomechanics

An efficient discrete-fracture model is used to explicitly model the fractured system. Flexible unstructured gridding is employed to model arbitrarilyoriented fractures. The interrelations among pore volume, permeability and geomechanical conditions are considered dynamically using two-way coupled flow and geomechanics computations.

Sequentially coupled flow and geomechanical simulation ...

extensively. To represent the fracture deformation explicitly, the discrete fracture model has been more widely used recently in coupled fluid flow and geomechanics problems. A fracture is defined as two surfaces in contact in the dis-crete fracture model presented by Garipov et al,18 in which a mechanical model for the fractures is derived to describe the changes in the stress and the displacement fields through the surfaces representing the fractures.

A coupled compressible flow and geomechanics model for ...

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The first hybrid model couples an embedded-discrete-fracture model (EDFM) with multiple interacting continua (MINC) into EDFM/MINC, which simulates the fracture network characterized by...

(PDF) Hybrid Coupled Discrete Fracture-Matrix and ...

A continuum model for coupled stress and fluid flow in discrete fracture networks Quan Gan . Derek Elsworth Received: 23 September 2015/Accepted: 9 December 2015/Published online: 5 January 2016 The Author(s) 2016. This article is published with open access at Springerlink.com Abstract We present a model coupling stress and

A continuum model for coupled stress and fluid flow in ...

In this work we consider a discrete fracture–matrix (DFM) model, where the fractures are modeled as lower dimensional interfaces embedded in the rock matrix. We assume Darcy flow both in the matrix and the fracture, and we only consider the case where the permeability in the fractures are orders of magnitude larger than in the matrix.

A simple embedded discrete fracture–matrix model for a ...

In this paper, a numerical model is developed for coupled analysis of deforming fractured porous media with multiscale fractures. In this model, the macro-fractures are modeled explicitly by the embedded discrete fracture model, and the supporting effects of fluid and fillings in these fractures are represented explicitly in the geomechanics model. On the other hand, matrix and micro-fractures are modeled by a multi-porosity model, which aims to accurately describe the transient matrix ...

An efficient hydro-mechanical model for coupled multi ...

A “discrete fracture network” (DFN) refers to a computational model that explicitly represents the geometrical properties of each individual fracture (e.g. orientation, size, position, shape and aperture), and the topological relationships between individual fractures and fracture sets.

The use of discrete fracture networks for modelling ...

Discrete Fracture Model For Coupled The Discrete Fracture Model (DFM) has been widely used to model the flow and transport in natural geological porous formations. Here, we extend the DFM approach to model deformation. The flow equations are

Discrete Fracture Model For Coupled Flow And

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A continuum model for coupled stress and fluid flow in ...

The sub-model is coupled to the discrete fracture sub-model through the fracture surface. The domain size of the sub-model is such that the dominant, time-variable, dynamic transport processes during the expected years of reservoir exploitation are captured within this geometry.

A New T-H-M-C Model Development for Discrete-Fracture EGS ...

In this study, we developed a new numerical manifold method model for analysis of fully coupled hydro-mechanical processes in porous rock with discrete fractures. In this model the porous rock and the fractures are both deformable and fluid conductive with large contrast of mechanical and hydraulic properties.

A numerical manifold method model for analyzing fully ...

The discrete fracture networks (DFNs) is quantitatively constructed according to the fracture density and stimulated reservoir area (SRA). This model is used to analyze the temporal/spatial evolution of the gas pressure and the net desorption rate.

Quantitative study in shale gas behaviors using a coupled ...

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Discrete Fracture Model For Coupled Flow And Geomechanics

A model based on the code CrunchClay is presented for a fracture-clay matrix system that takes electrostatic effects on transport into account. The electrostatic effects on transport include those associated with the development of a diffusion potential as captured by the Nernst-Planck equation, and the formation of a diffuse layer bordering negatively charged clay particles within which ...

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The discrete fractures were idealised as lower-dimensional geometric objects with the discrete fracture elements located on the edges of continuum elements sharing the same nodes. The coupling between the two flow systems was achieved by using the principle of superposition.

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Transient transfer shape factor between matrix and fracture should be considered. Considering the transient transfer, a simulation workflow is developed

using Discrete-Fracture and Continuum Models, i.e., embedded-discrete-fracture model (EDFM) and dual porosity (DP) model. We consider the SRV region and USRV region respectively.

Discrete Fracture Network Modeling of Hydraulic Stimulation describes the development and testing of a model that couples fluid-flow, deformation, friction weakening, and permeability evolution in large, complex two-dimensional discrete fracture networks. The model can be used to explore the behavior of hydraulic stimulation in settings where matrix permeability is low and preexisting fractures play an important role, such as Enhanced Geothermal Systems and gas shale. Used also to describe pure shear stimulation, mixed-mechanism stimulation, or pure opening-mode stimulation. A variety of novel techniques to ensure efficiency and realistic model behavior are implemented, and tested. The simulation methodology can also be used as an efficient method for directly solving quasistatic fracture contact problems. Results show how stresses induced by fracture deformation during stimulation directly impact the mechanism of propagation and the resulting fracture network.

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

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

The aim of this monograph is to describe the main concepts and recent - vances in multiscale ?nite element methods. This monograph is intended for the broaderaudienceincludingengineers,appliedscientists, andforthosewho are interested in multiscale simulations. The book is intended for graduate students in applied mathematics and those interested in multiscale compu- tions. It combines a practical introduction, numerical results, and analysis of multiscale ?nite element methods. Due to the page limitation, the material has been condensed. Each chapter of the book starts with an introduction and description of the proposed methods and motivating examples. Some new techniques are introduced using formal arguments that are justi?ed later in the last chapter. Numerical examples demonstrating the signi?cance of the proposed methods are presented in each chapter following the description of the methods. In the last chapter, we analyze a few representative cases with the objective of demonstrating the main error sources and the convergence of the proposed methods. A brief outline of the book is as follows. The ?rst chapter gives a general introductiontomultiscalemethodsandanoutline ofeachchapter.Thesecond chapter discusses the main idea of the multiscale ?nite element method and its extensions. This chapter also gives an overview of multiscale ?nite element methods and other related methods. The third chapter discusses the ext- sion of multiscale ?nite element methods to nonlinear problems. The fourth chapter focuses on multiscale methods that use limited global information.

Constitutive modelling is the mathematical description of how materials respond to various loadings. This is the most intensely researched field within solid mechanics because of its complexity and the importance of accurate constitutive models for practical engineering problems. Topics covered include: Elasticity - Plasticity theory - Creep theory - The nonlinear finite element method - Solution of nonlinear equilibrium equations - Integration of elastoplastic constitutive equations - The thermodynamic framework for constitutive modelling – Thermoplasticity - Uniqueness and discontinuous bifurcations More comprehensive in scope than competitive titles, with detailed discussion of thermodynamics and numerical methods. Offers appropriate strategies for numerical solution, illustrated by discussion of specific models.

Demonstrates each topic in a complete and self-contained framework, with extensive referencing.

This book provides a systematic treatment of the geometrical and transport properties of fractures, fracture networks, and fractured porous media. It is divided into two major parts. The first part deals with geometry of individual fractures and of fracture networks. The use of the dimensionless density rationalizes the results for the percolation threshold of the networks. It presents the crucial advantage of grouping the numerical data for various fracture shapes. The second part deals mainly with permeability under steady conditions of fractures, fracture networks, and fractured porous media. Again the results for various types of networks can be rationalized by means of the dimensionless density. A chapter is dedicated to two phase flow in fractured porous media.

Discrete Fracture Network Modeling of Hydraulic Stimulation describes the development and testing of a model that couples fluid-flow, deformation, friction weakening, and permeability evolution in large, complex two-dimensional discrete fracture networks. The model can be used to explore the behavior of hydraulic stimulation in settings where matrix permeability is low and preexisting fractures play an important role, such as Enhanced Geothermal Systems and gas shale. Used also to describe pure shear stimulation, mixed-mechanism stimulation, or pure opening-mode stimulation. A variety of novel techniques to ensure efficiency and realistic model behavior are implemented, and tested. The simulation methodology can also be used as an efficient method for directly solving quasistatic fracture contact problems. Results show how stresses induced by fracture deformation during stimulation directly impact the mechanism of propagation and the resulting fracture network.

This book mainly focuses on the adaptive analysis of damage and fracture in rock, taking into account multiphysical fields coupling (thermal, hydro, mechanical, and chemical fields). This type of coupling is a crucial aspect in practical engineering for e.g. coal mining, oil and gas exploration, and civil engineering. However, understanding the influencing mechanisms and preventing the disasters resulting from damage and fracture evolution in rocks require high-precision and reliable solutions. This book proposes adaptive numerical algorithms and simulation analysis methods that offer significant advantages in terms of accuracy and reliability. It helps readers understand these innovative methods quickly and easily. The content consists of: (1) a finite element algorithm for modeling the continuum damage evolution in rocks, (2) adaptive finite element analysis for continuum damage evolution and determining the wellbore stability of transversely isotropic rock, (3) an adaptive finite element algorithm for damage detection in non-uniform Euler–Bernoulli beams with multiple cracks, using natural frequencies, (4) adaptive finite element–discrete element analysis for determining multistage hydrofracturing in naturally fractured reservoirs, (5) adaptive finite element–discrete element analysis for multistage supercritical CO2 fracturing and microseismic modeling, and (6) an adaptive finite element–discrete element–finite volume algorithm for 3D multiscale propagation of hydraulic fracture networks, taking into account hydro-mechanical coupling. Given its scope, the book offers a valuable reference guide for researchers, postgraduates and undergraduates majoring in engineering mechanics, mining engineering, geotechnical engineering, and geological engineering.

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.

Among the most important and exciting current steps forward in geo-engineering is the development of coupled numerical models. They represent the basic physics of geo-engineering processes which can include the effects of heat, water, mechanics and chemistry. Such models provide an integrating focus for the wide range of geo-engineering disciplines. The articles within this volume were originally presented at the inaugural GeoProc conference held in Stockholm and contain a collection of unusually high quality information not available elsewhere in an edited and coherent form. This collection not only benefits from the latest theoretical developments but also applies them to a number of practical and wide ranging applications. Examples include the environmental issues around radioactive waste disposal deep in rock, and the search for new reserves of oil and gas.