1. Record Nr. UNINA9910298378703321

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Titolo	FEFLOW : Finite Element Modeling of Flow, Mass and Heat Transport in Porous and Fractured Media / / by Hans-Jörg G. Diersch
Pubbl/distr/stampa	Berlin, Heidelberg : , : Springer Berlin Heidelberg : , : Imprint : Springer, , 2014
ISBN	3-642-38739-X
Edizione	[1st ed. 2014.]
Descrizione fisica	1 online resource (1018 p.)
Disciplina	526.1
Soggetti	Hydrogeology Engineering geology Engineering—Geology Foundations Hydraulics Geotechnical engineering Geophysics Geoengineering, Foundations, Hydraulics Geotechnical Engineering & Applied Earth Sciences Geophysics/Geodesy
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di contenuto	Introduction -- Part I Fundamentals -- Preliminaries -- Porous Medium -- Discrete Feature -- Chemical Reaction -- Initial Boundary and Constraint Conditions -- Part II Finite Elemente Method -- Fundamental Concepts of Finite Element Method (FEM) -- Flow in Saturated Porous Media - Groundwater Flow -- Flow in Variably Saturated Porous Media -- Variable-Density Flow, Mass and heat Transport in Porous Media -- Mass Transport in Porous Media with and without chemical reactions -- Heat Transport in Porous Media -- Discrete Feature Modeling of Flow, Mass and Heat Transport Processes -- Nomenclature -- Coleman and Noll Method -- Thermally variable Fluid Density Expansion -- Parametric Models for Variably Saturated Porous Media -- Heat Transfer and Thermal Resistance for Wall Configurations -- Optimality of the Galerkin Method -- Isoparametric Finite Element Matrices and Vectors

-- Parameters in Relation to Selected Problem Class, Medium Type and Dimension -- Elements of PVST for Solving the Mixed sBased Form of Richards' Equation -- Integral Functions of the Frolkovi c-Knabner Algorithm (FKA) -- Formulation of Hydraulic Head BC's for Variable-Density Problems -- BHE Modeling: Numerical and Analytical Approaches -- References -- Index .

Sommario/riassunto

FEFLOW is an acronym of Finite Element subsurface FLOW simulation system and solves the governing flow, mass and heat transport equations in porous and fractured media by a multidimensional finite element method for complex geometric and parametric situations including variable fluid density, variable saturation, free surface(s), multispecies reaction kinetics, non-isothermal flow and multidiffusive effects. FEFLOW comprises theoretical work, modeling experiences and simulation practice from a period of about 40 years. In this light, the main objective of the present book is to share this achieved level of modeling with all required details of the physical and numerical background with the reader. The book is intended to put advanced theoretical and numerical methods into the hands of modeling practitioners and scientists. It starts with a more general theory for all relevant flow and transport phenomena on the basis of the continuum approach, systematically develops the basic framework for important classes of problems (e.g., multiphase/multispecies non-isothermal flow and transport phenomena, discrete features, aquifer-averaged equations, geothermal processes), introduces finite-element techniques for solving the basic balance equations, in detail discusses advanced numerical algorithms for the resulting nonlinear and linear problems and completes with a number of benchmarks, applications and exercises to illustrate the different types of problems and ways to tackle them successfully (e.g., flow and seepage problems, unsaturated-saturated flow, advective-diffusion transport, saltwater intrusion, geothermal and thermohaline flow).