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FEFLOW: Finite Element Modeling of Flow, Mass and Heat Transport in Porous and Fractured Media

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INTRODUCTION AND OVERVIEW

FEFLOW, an acronym for *Finite Element subsurface FLOW simulation system*, is a comprehensive tool designed to solve governing flow, mass, and heat transport equations within porous and fractured media. It utilizes a multidimensional finite element method to address complex geometric and parametric situations. This includes scenarios involving variable fluid density, variable saturation, free surface(s), multispecies reaction kinetics, non-isothermal flow, and multidiffusive effects.

This book compiles theoretical work, modeling experiences, and simulation practices accumulated over approximately 40 years. Its primary objective is to share this advanced level of modeling, providing all necessary details regarding the physical and numerical background to the reader. It aims to equip modeling practitioners and scientists with advanced theoretical and numerical methods.

CORE PRINCIPLES AND METHODOLOGY

The manual begins with a general theory covering all relevant flow and transport phenomena based on the continuum approach. It systematically develops the basic framework for important classes of problems, including:

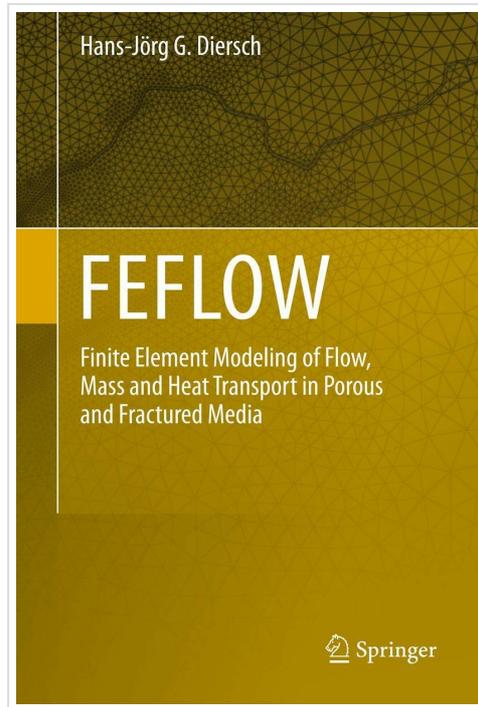
- Multiphase/multispecies non-isothermal flow and transport phenomena.
- Discrete features.
- Aquifer-averaged equations.
- Geothermal processes.

It introduces finite-element techniques for solving the basic balance equations and thoroughly discusses advanced numerical algorithms for the resulting nonlinear and linear problems.

APPLICATIONS AND EXERCISES

The book concludes with a series of benchmarks, applications, and exercises designed to illustrate various problem types and effective approaches to solve them. These practical examples cover a range of scenarios:

- Flow and seepage problems.
- Unsaturated-saturated flow.
- Advective-diffusion transport.
- Saltwater intrusion.
- Geothermal and thermohaline flow.



This image displays the front cover of the book 'FEFLOW: Finite Element Modeling of Flow, Mass and Heat Transport in Porous and Fractured Media'. The cover features the title 'FEFLOW' prominently in large white letters, with the full subtitle below it. The author's name, Hans-Jörg G. Diersch, is at the top. The bottom right corner shows the Springer logo, indicating the publisher. The background is a mesh-like pattern in shades of gold and brown, representing the finite element modeling concepts discussed in the book.

SPECIFICATIONS

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ABOUT THE AUTHOR

Hans-Jörg G. Diersch is the founder of the finite-element simulation system FEFLOW. He holds a professorship in flow dynamics. His extensive work includes a variety of theoretical and practical investigations, with a particular focus on variable-density flow, the modeling of mass and heat transport processes, and commercial software developments.