Hydrogeology And Groundwater Flow Model Central Catchment

This book explores the application of the open-source software OpenGeoSys (OGS) for hydrological numerical simulations concerning conservative and reactive transport modeling. It provides general information on the hydrological and groundwater flow modeling of a real case study and step-by-step model set-up with OGS, while also highlighting related components such as the OGS Data Explorer. The material is based on unpublished manuals and the results of a collaborative project between China and Germany (SUSTAIN H2O). Though the book is primarily intended for graduate students and applied scientists who deal with hydrological modeling, it also offers a valuable source of information for professional geoscientists wishing to expand their knowledge of the numerical modeling of hydrological processes including nitrate reactive transport modeling. This book is the second in a series that showcases further applications of computational modeling in hydrological science.

This CD contains a 125-page comprehensive study of the hydrogeology of Cedar Valley, Utah County, located in north-central Utah. The report includes 72 figures; two plates, one of which is a potentiometric map of the basin-fill, bedrock, and several perched aquifers; and seven appendices of data. Field investigations included groundwater chemistry sampling, regular water-level monitoring, and multiple-well aquifer testing. The field data were incorporated into a 3D digital groundwater flow model using MODFLOW2000. Seventy percent of the recharge to the Cedar Valley aquifer system is from precipitation in the Oquirrh Mountains. Groundwater generally flows from west to east and exits the aquifer system mostly as interbasin flow through bedrock to the northeast and southeast. The groundwater model showed a 39-year (1969-2007) average recharge to the Cedar Valley groundwater system of 25,600 acre-feet per year and discharge of 25,200 acre-feet per year. A significant volume of precipitation recharge (perhaps 4300 acre-feet per year) does not interact with the basin-fill aquifer but travels within bedrock to discharge to adjacent valleys or as bedrock well discharge. 125 pages + 2 plates

This book offer a complete simulation system for modeling groundwater flow and transport processes. The companion full-version software (PMWIN) comes with a professional graphical user-interface, supported models and programs and several other useful modeling tools. Tools include a Presentation Tool, a Result Extractor, a Field Interpolator, a Field Generator, a Water Budget Calculator and a Graphic Viewer. Book targeted at novice and experienced groundwater modelers.

This second edition is extensively revised throughout with expanded discussion of modeling fundamentals and coverage of advances in model calibration and uncertainty analysis that are revolutionizing the science of groundwater modeling. The text is intended for undergraduate and graduate level courses in applied groundwater modeling and as a comprehensive reference for environmental consultants and scientists/engineers in industry and governmental agencies. Explains how to formulate a conceptual model of a groundwater system and translate it into a numerical model Demonstrates how modeling concepts, including boundary conditions, are implemented in two groundwater flow codes-- MODFLOW (for finite differences) and FEFLOW (for finite elements) Discusses particle tracking methods and codes for flowpath analysis and advective transport of contaminants Summarizes parameter estimation and uncertainty analysis approaches using the code PEST to illustrate how concepts are implemented Discusses modeling ethics and preparation of the modeling report Includes Boxes that amplify and supplement topics covered in the text Each chapter presents lists of common modeling errors and problem sets that illustrate concepts

A reference for students, researchers, and environmental professionals, Hydrogeological Conceptual Site Models: Data Analysis and Visualization explains how to develop effective conceptual site models, perform advanced spatial data analysis, and generate informative graphics for applications in hydrogeology and groundwater remediation. Written by expert practitioners, this full-color book illustrates how fundamental hydrogeological concepts are translated into quantitative, high-resolution computer visualizations. In addition, the authors discuss topics not typically covered in conventional textbooks, including GIS technology and the relationship between conceptual site models and environmental policy. Advanced Methods for Data Analysis and Visualization Featuring more than 500 color illustrations, this unique and visually powerful book outlines the required elements of a conceptual site model and provides numerous examples of supporting charts, cross-sections, maps, and 3D graphics. The authors describe advanced analytical methods such as geospatial processing, kriging, and groundwater modeling through practical real-life examples. They also present numerous case studies in groundwater supply and remediation to help explain key engineering design concepts. Data-Driven Assessments of Groundwater Management Policy The authors tackle controversial topics, ranging from technical impracticability of groundwater remediation to sustainable management of groundwater resources. They encourage discussion and independent thought about how current environmental policies and practices can evolve to achieve better outcomes at less cost to society. Practical Strategies for Communicating Your Findings to the General Public While the book is technical in nature, equations and advanced theory are kept to a minimum. The text focuses on practical strategies to help you create easy-to-understand data tables, graphs, maps, and illustrations for technical and nontechnical audiences alike. A companion DVD includes animations, reference material, modeling software, and more.

Modeling has become an essential tool for the groundwater hydrologist. Where field data is limited, the analytic element method (AEM) is rapidly becoming the modeling method of choice, especially given the availability of affordable modeling software. Analytic Element Modeling of Groundwater Flow provides all the basics necessary to approach AEM successfully, including a presentation of fundamental concepts and a thorough introduction to Dupuit-Forchheimerflow. This book is unique in its emphasis on the actual use of analytic element models. Real-world examples complement material presented in the text. An educational version of the analytic element program GFLOW is included to allow the reader to reproduce the various solutions to groundwater flow problems discussed in the text. Researchers and graduate students in groundwater hydrology, geology, andengineering will find this book an indispensable resource. * * Provides a fundamental introduction to the use of the analytic element method. * Offers a step-by-step approach to groundwater flow modeling. * Includes an educational version of the GFLOW modeling software.

The dramatic advances in the efficiency of digital computers during the past decade have provided hydrologists with a powerful tool for numerical modeling of groundwater systems. Introduction to Groundwater Modeling presents a broad, comprehensive overview of the fundamental concepts and applications of computerized groundwater modeling. The book covers both finite difference and finite element methods and includes practical sample programs that demonstrate theoretical points described in the text. Each chapter is followed by problems, notes, and references to additional information. This volume will be indispensable to students in introductory groundwater modeling courses as well as to groundwater professionals wishing to gain a complete introduction to this vital subject. Key Features * Systematic exposition of the basic ideas and results of Hilbert space theory and functional analysis * Great variety of applications that are not available in comparable books * Different approach to the Lebesgue integral, which makes the theory easier, more intuitive, and more accessible to undergraduate students

Quantitative Solutions in Hydrogeology and Groundwater Modeling addresses and solves a variety of questions and problems from hydrogeological practice. It includes major aspects of quantitative groundwater evaluation, from basic laboratory determination of hydrogeological parameters to complex analytical calculations and modeling for engineering purposes. Groundwater modeling is a strong trend in hydrogeology. Recent years have seen the rapid development of sophisticated and powerful groundwater models, along with a decrease in the use of the more mathematically demanding analytical quantitative solutions. Quantitative Solutions in Hydrogeology and Groundwater Modeling avoids this conflict by explaining both modeling and mathematical solutions in detail.

A groundwater flow model encompassing approximately 4 mi2 within C Reactor area has been developed. The objectives and goals of the C Reactor Area groundwater model are to: Provide a common hydrogeologic and groundwater flow modeling framework for C Area that can be easily updated as additional field data is collected from waste site investigations. Provide a baseline groundwater flow model for use in subsequent flow and transport simulations for remedial/feasibility studies for C Area waste sites. Provide baseline transport simulations for CBRP and CRSB that reconstruct historical contaminant distributions and simulate future plume migration from each waste unit. Provide a working groundwater flow model for particle tracking and analysis to guide subsequent field characterization activities. The model incorporates historical and current field characterization data up through spring 1999. The model simulates groundwater flow within the area bounded to the west and north by Fourmile Branch, to the south by Caster Creek, and to the east by a line between Fourmile Branch and the headwaters of Caster Creek. Vertically the model extends from ground surface to the top of the Gordon aquifer. The chosen areal grid is 14,600 by 13,200 feet with a resolution of 200 feet. The model accurately reproduces groundwater flow directions from the CBRP and CRSB, and matches targets for hydraulic head, recharge and baseflow within calibration goals. The hydrogeologic model reflects aquifer heterogeneity as derived from CPT lithologic data.

This text combines the science and engineering of hydrogeology in an accessible, innovative style. As well as providing physical descriptions and characterisations of hydrogeological processes, it also sets out the corresponding mathematical equations for groundwater flow and solute/heat transport calculations. And, within this, the methodological and conceptual aspects for flow and contaminant transport modelling are discussed in detail. This comprehensive analysis forms the ideal textbook for graduate and undergraduate students interested in groundwater resources and engineering, and indeed its analyses can apply to researchers and professionals involved in the area.

A regional groundwater flow model encompassing approximately 100 mi2 surrounding the C, K.L. and P reactor areas has been developed. The Reactor flow model is designed to meet the planning objectives outlined in the General Groundwater Strategy for Reactor Area Projects by providing a common framework for analyzing groundwater flow, contaminant migration and remedial alternatives within the Reactor Projects team of the Environmental Restoration Department.

Groundwater is a vital source of water throughout the world. As the number of groundwater investigations increase, it is important to understand how to develop comprehensive quantified conceptual models and appreciate the basis of analytical solutions or numerical methods of modelling groundwater flow. Groundwater Hydrology: Conceptual and Computational Models describes advances in both conceptual and numerical modelling. It gives insights into the interpretation of field information, the development of conceptual models, the use of computational models based on analytical and numerical techniques, the assessment of the adequacy of models, and the use of computational models for predictive purposes. It focuses on the study of groundwater flow problems and a thorough analysis of real practical field case studies. It is divided into three parts: * Part I deals with the basic principles, including a summary of mathematical descriptions of groundwater flow, recharge estimation using soil moisture balance techniques, and extensive studies of groundwater-surface water interactions. * Part II focuses on the concepts and methods of analysis for radial flow to boreholes including topics such as large diameter wells, multi-layered aquifer systems, aquitard storage and the prediction of long-term yield. * Part III examines regional groundwater flow including situations when vertical flows are important or transmissivities change with saturated depth. Suitable for practising engineers, hydrogeologists, researchers in groundwater and irrigation, mathematical modellers, groundwater scientists, and water resource specialists. Appropriate for upper level undergraduates and MSc students in Departments of Civil Engineering, Environmental Engineering, Earth Science and Physical Geography. It would also be useful for hydrologists, civil engineers, physical geographers, agricultural engineers, consultancy firms involved in water resource projects, and overseas development workers.

Hydrogeology and Groundwater ModelingCRC Press

Coupling the basics of hygrogeology with analytical and numerical modeling methods, Hydrogeology and Groundwater Modeling, Second Edition provides detailed coverage of both theory and practice. Written by a leading hydrogeologist who has consulted for industry and environmental agencies and taught at major universities around the world, this unique book fills a gap in the groundwater hydrogeology literature. With more than 40 real-world examples, the book is a source for clear, easy-to-understand, and step-by-step quantitative groundwater evaluation and contaminant fate and transport analysis, from basic laboratory determination to complex analytical calculations and computer modeling. It provides more than 400 drawings, graphs, and photographs, and a variety of useful tables of all key groundwater parameters, as well as lucid, straightforward answers to common hydrogeological problems. Reflecting nearly ten years of new scholarship since the publication of the bestselling first edition, this second edition is wider in focus with added and updated examples, figures, and problems, yet still provides information in the author's trademark, user-friendly style. No other book offers such carefully selected examples and clear, elegantly explained solutions. The inclusion of step-by-step solutions to real problems builds a knowledge base for understanding and solving groundwater issues.

The Lost Creek Designated Ground Water Basin (Lost Creek basin) is an important alluvial aquifer for irrigation, public supply, and domestic water uses in northeastern Colorado. Urban growth in the adjacent Front Range urban corridor has increased demand for groundwater in the basin, and potential exportation of groundwater from the basin has raised concerns about the long-term sustainability and management of the basin's groundwater resources. Beginning in 2005, the U.S. Geological Survey, in cooperation with the Lost Creek Ground Water Management District and the Colorado Water Conservation Board, collected hydrologic data and constructed a numerical groundwater flow model of the Lost Creek basin. The steady-state model builds upon the work of previous investigators to provide an updated tool for simulating the potential effects of various hydrologic stresses on groundwater flow and evaluating possible aquifer-management strategies.

Elevated groundwater nitrate (NO_3^-) concentrations in the Southern Willamette Valley (SWV) caused the Oregon Department of Environmental Quality (ODEQ) to declare a Groundwater Management Area (GWMA) in Spring, 2004. To better understand direction of groundwater flow, groundwater age, and nitrate transport pathways of the SWV we developed a steady-state numerical groundwater flow model using MODFLOW with MODPATH. Model development was supplemented by field investigations of local outcrops, pump and slug tests, and laboratory analyses to determine groundwater age and groundwater chemistry. Field work included the construction/collection of cross-sections and stratigraphic columns; 12 slug tests and 3 pump tests to determine hydraulic conductivity and storativity; 10 groundwater ages using CFC-11, CFC-12, and CFC-113; 3 wells instrumented to collect long-term continuous water level measurements; 42 wells selected for quarterly manual water level measurements; and 14 groundwater samples to determine pH, dissolved oxygen, specific electrical conductance, chloride, sulfate, and nitrate concentrations. Slug tests determined horizontal hydraulic conductivities (Kx) from 4.19 x 10-8 m/s to 4.62 x 10-4 m/s. Pump tests determined Kx-values from 3.59 x 10-4 m/s to 7.22 x 10-3 m/s, vertical hydraulic conductivities (Kv) from 3.48 x 10-6 m/s to 3.84 x 10-6 m/s, and storage coefficients from 0.05 to 0.15. Groundwater age ranged from 13 years to>50 years, with the greatest ages resulting from wells that penetrated the semi-confining Willamette Silt. Groundwater ages were compared to model particle travel times using MODPATH and used as calibration targets. Groundwater ages along with nitrate, chloride, sulfate, and dissolved oxygen concentrations were used to reconstruct past contaminant loading and observe data trends. Spatial distributions of hydraulic conductivity were estimated using wells with specific capacity data and an empirical relationship (T = 158.48sc, where T = transmissivity (ft2/d) and sc = (gal/min/ft); R2 = 0.61) between wells in the study area that contained both specific capacity and aquifer test data. The calibrated groundwater flow model is intended to help make management decisions, establish monitoring programs, and to be used as an outreach education tool. Model simulations were run in key areas to demonstrate model capabilities and create visual aids for outreach education. This study suggests it may take 10?s of years to see measurable declines of groundwater nitrate in some locations. It is our hope that educating stakeholders about local groundwater flow along with stressing the use of Best Management Practices (BMPs) will result in better decision making and lead to a reduction of groundwater nitrate concentration in the SWV.

Coupling the basics of hygrogeology with analytical and numerical modeling methods, Hydrogeology and Groundwater Modeling, Second Edition provides detailed coverage of both theory and practice. Written by a leading hydrogeologist who has consulted for industry and environmental agencies and taught at major universities around the world, this unique