Calibration And Reliability In Groundwater Modelling

These proceedings, with cd-rom, present a comprehensive overview of advances in groundwater research. The five main topics covered are: aquifers and contaminant distribution; groundwater quality; natural attenuation; remediation technologies and groundwater protection. Groundwater 2000 is a useful resource to both scientists and to those working in the field.

Methods and guidelines for developing and using mathematical models Turn to Effective Groundwater Model Calibration for a set of methods and guidelines that can help produce more accurate and transparent mathematical models. The models can represent groundwater flow and transport and other natural and engineered systems. Use this book and its extensive exercises to learn methods to fully exploit the data on hand, maximize the model's potential, and troubleshoot any problems that arise. Use the methods to perform: Sensitivity analysis to evaluate the information content of data Data assessment to identify (a) existing measurements that dominate model development and predictions and (b) potential measurements likely to improve the reliability of predictions Calibration to develop models that are consistent with the data in an optimal manner Uncertainty evaluation to quantify and communicate errors in simulated results that are often used to make important societal decisions Most of the methods are based on linear and nonlinear regression theory. Fourteen guidelines show the reader how to use the methods advantageously in practical situations. Exercises focus on a groundwater flow system and management problem, enabling readers to apply all the methods presented in the text. The exercises can be completed using the material provided in the book, or as hands-on computer exercises using instructions and files available on the text's accompanying Web site. Throughout the book, the authors stress the need for valid statistical concepts and easily understood presentation methods required to achieve well-tested, transparent models. Most of the examples and all of the exercises focus on simulating groundwater systems; other examples come from surface-water hydrology and geophysics. The methods and guidelines in the text are broadly applicable and can be used by students, researchers, and engineers to simulate many kinds systems.

The usefulness of the predictive simulations obtained with groundwater models is often hampered by the inability to indicate and preferably quantify the reliability of the model results. Uncertainty in model predictions stems primarily from a number of errors relating to the model formulation such as: inadequate concept of processes and interactions; inadequate description of processes and interactions; inadequate sense of spatial and temporal variability; inadequate description of the state of the system; incorrect coefficient values and improper specification of the error bounds. In recent years much research has been carried out resulting in a variety of approaches that can be followed to incorporate the information about these errors into modelling process. Various

techniques have been developed to assess the confidence levels of model predictions so that users can account for uncertainties in the decision-making process. This publication contains 52 papers the ModelCARE 90 conference held in The Hague, September 1990.

Creating numerical groundwater models of field problems requires careful attention to describing the problem domain, selecting boundary conditions, assigning model parameters, and calibrating the model. This unique text describes the science and art of applying numerical models of groundwater flow and advective transport of solutes. Key Features * Explains how to formulate a conceptual model of a system and how to translate it into a numerical model * Includes the application of modeling principles with special attention to the finite difference flow codes PLASM and MODFLOW, and the finite-element code AQUIFEM-1 * Covers model calibration, verification, and validation * Discusses pathline analysis for tracking contaminants with reference to newly developed particle tracking codes * Makes extensive use of case studies and problems

Several of the papers here deal with decision making under uncertainty.

Calibration and Reliability in Groundwater ModellingFrom Uncertainty to Decision MakingInternational Assn of Hydrological Sciences

Written by renowned experts in the field, this book assesses the status of groundwater models and defines models and modeling needs in the 21st century. It reviews the state of the art in model development and application in regional groundwater management, unsaturated flow/multiphase flow and transport, island modeling, biological and virus transport, and fracture flow. Both deterministic and stochastic aspects of unsaturated flow and transport are covered. The book also introduces a unique assessment of models as analysis and management tools for groundwater resources. Topics covered include model vs. data uncertainty, accuracy of the dispersion/convection equation, protocols for model testing and validation, post-audit studies, and applying models to karst aquifers.