BOOK REVIEWS

Biological Control: Benefits and Risks


Our knowledge of biological control of insect pests, plant pathogens, and weeds has increased dramatically during the past two decades. The number of diseases, pests, and weeds controlled in full-scale systems is increasing as well. Thousands of field trials have been performed with genetically engineered microorganisms designed to enhance performance of natural strains. Similarly, exotic pests are used widely today for control of insect pests. Obviously, risks are associated with these introductions. This comprehensive hard cover book was prepared to cover fundamental as well as applied aspects of biological control. This goal was achieved.

The book contains the proceedings of an international workshop held in March 1992 in Saariselka Finnish Lapland. The status of biological control at the time is presented in 32 chapters divided into the following parts: (i) biological invasions; (ii) classical biological control; (iii) augmentative biocontrol; (iv) use of genetically modified organisms; and (v) economics and registration.

Authors contributing to this book represent many of the major groups active in this field across the globe. As a result, it is a very useful text for students of biological control. The book should also be of interest to practitioners in this field, information centers, and libraries. —HARRY A.J. HOITINK, Ohio Agricultural Research and Development Center, Ohio State University, Plant Pathology, 1680 Madison Ave., Wooster, OH 44691 (hoitink.1@osu.edu).

Applied Contaminant Transport Modeling: Theory and Practice


Groundwater is a young science; groundwater modeling is an even younger science. Comprehensive modeling of groundwater involves an understanding of physical, chemical, and biological processes as well as knowledge of applied mathematics and computer science. As advanced computation methods are being developed and computer capacities are enhanced, numerical models are increasingly becoming efficient, economical tools for studying subsurface contaminant transport processes.

Applied Contaminant Transport Modeling: Theory and Practice is aimed to provide general aspects of theory and applications in contaminant transport modeling of groundwater. The book is logically divided into two parts. Part 1, which consists of six chapters, introduces basic theory and concepts of solute transport in groundwater, the most frequently used numerical methods for solving transport equations, and the common transport models in field applications. Chapter 1 presents the concepts and types of calculation of advective transport. Chapter 2 discusses the advective-dispersive solute transport equation by considering mainly the hydrodynamic dispersion related to microscopic velocity variations and macroscopic heterogeneity. In Chapter 3, two chemical processes, sorption and first-order irreversible rate reactions, are discussed and incorporated in solute transport models. Chapter 4 reviews the process of developing a mathematical model, i.e., combining the governing equation with boundary and initial conditions. Chapter 5 presents the methods for solving the transport equation. The authors emphasize the Eulerian-Lagrangian methods, providing a relatively brief review for Eulerian methods, such as the finite element method. Part 2, from Chapter 7 through Chapter 12, addresses field applications of the concepts and models discussed in Part 1 to practical contaminant transport problems. Chapter 7 is a bridge between the mathematical models and applications, and summarizes some important decisions for modeling planning. Major factors concerning a contaminant transport model building are considered in Chapter 8, and include spatial and temporal discretizations, treatment of initial and boundary conditions as well as sink and source terms, and data management. Chapter 9 discusses input data and parameters. Model calibration and sensitivity analysis are considered in Chapter 10, and sources, evaluation, and management of uncertainty are dealt with in Chapter 11. Chapter 12 presents three complete case studies.

The book is well written and organized. It covers most topics relevant to contaminant transport modeling under saturated flow conditions. The topics covered in Part 2 are very interesting and will be useful in terms of modeling applications. The compilation of flow, transport, and chemical parameters should be helpful for selecting input information, which is another critical component for successful modeling. The case studies are valuable for illustrating the key components of modeling applications, though the assumptions of steady-state flow and constant hydraulic conductivities are debatable for the field studies with the large time and space scales. As important issues of contaminant transport modeling, sensitivity and uncertainty analyses are discussed; problems related to large-scale modeling, such as spatial and temporal variability, physical and chemical heterogeneity, and scale-dependent parameters are not addressed in sufficient detail.

The book does not provide detailed derivations for implementation of the numerical methods. Instead, the book has included broader descriptions of the methods with available general codes and useful information on groundwater modeling software. Considering the overall information contained in the book, it is suitable for graduate students. I will use the book as a reference for my graduate class, "Modeling Flow Transport in Soil and Groundwater Systems." I also highly recommend the book as a valuable reference for hydrogeologists and engineers. —R. ZHANG, Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071-3354, (renduo@uwyo.edu).