BOOK REVIEWS

Trace Elements in Terrestrial Environments: Biogeochemistry, Bioavailability, and Risks of Metals, 2nd Edition


As we move into the 21st century, the impact of trace elements in the environment will expand. Environmental and human health issues surround the role and fate of trace elements in soil–water–biota systems. Whether as pollutants and toxins, or as micronutrients, the biogeochemistry of these elements is of continued concern. Advances in analytical chemistry, combined with multidisciplinary research, are critical to understanding the behavior of and managing trace elements in the environment.

The focus of this book is to provide a comprehensive reference on trace elements in the environment. The book builds on the first edition by providing updated references on 21 trace elements, and by expanding the first chapter of the first edition into six chapters. This expansion provides a detailed review of biogeochemical processes, bioavailability, contamination and regulation, ecological and health risks, and risk assessment and management of trace elements. Furthermore, although the title states terrestrial environments, the book goes beyond soil and plants in many instances, providing background information on ground water and aquatic systems and their associated biota as well.

The book may be divided into two sections. The first six chapters deal with basic processes, fate and transport, and the management of trace elements. Chapter 2 provides an excellent review of biogeochemical processes, but focuses primarily on trace metals. Chapter 3 follows the same trend, covering the bioavailability of trace metals with a concentration on soil–plant interactions. Although United States regulations are highlighted, Chapter 4 provides information on both domestic and international regulations. Chapters 5 and 6 deal with the risk and management of trace metals using a combination of basic concepts and case studies, and again both U.S. and international examples are presented. The one drawback to this book is the section on remedial technologies. While a welcome addition to the book, this section should not be considered a comprehensive review of the topic, but rather a brief introduction.

The second section on individual trace elements covers Chapters 7 through 19. These chapters represent the heart of the book and are updated versions of the same chapters in the first edition. Twenty-one elements are covered to various degrees, and the literature reviewed for each is a valuable asset to one’s library.

The book is well written and should be of interest to professionals and advanced graduate students in a wide range of disciplines ranging from soil scientists to plant physiologists and the regulatory community. The expansion of the text to include more detailed background on the processes controlling the fate, transport, and bioavailability of trace elements allows this book to be considered as a text for graduate courses on trace element biogeochemistry. Certainly, it is a must-have reference for any scientist dealing with trace elements in the environment.

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Mathematical Models of Small Watershed Hydrology and Applications

Vijay P. Singh and Donald K. Frevert, Water Resources Publications LLC, P.O. Box 260026, Highlands Ranch, CO 80163-0026. 2002. 972 pp. $95.00 hardback, $270.00 with CD-ROM disks. ISBN 1-887201-35-1.

Concern over flooding and water quality has driven the development of hydrologic models applicable to the scale of small watersheds. The editors have compiled a comprehensive book describing 23 hydrologic models in common use around the world. These models are used in a wide variety of disciplines, including soil and environmental sciences, civil and agricultural engineering, forestry and range science, and climatology.

The models are presented in one of five categories, namely, distributed, parametric, monthly water balance, real-time flow forecasting, or environmental models. Both deterministic and stochastic modeling approaches are included. For each model the authors describe the common uses of the model, the theoretical foundations and assumptions of the model, the types of input data required, and applications of the model using real data, along with a description of model accuracy during calibration or validation. Most of the models allow flexibility in spatial discretization, with mesh sizes ranging from 30 m to 4 km.

Soil and environmental scientists will be particularly interested in the following seven models:

Distributed Models

SHETRAN: Gives flow, sediment, and solute losses in response to snowmelt runoff and rainfall; also allows consideration of gully and channel erosion processes. Supports mesh sizes up to 2 km. Excellent discussion of the validation process, including “blind” validation.

CASC2D: Useful for flood and flash flood forecasting and sediment losses. Good discussion of sources of uncertainty due to mesh size, rainfall inputs, and soil spatial variability.

DWSM: Designed to assess risks of flooding, sedimentation, and water pollution in response to sediments, nutrients, and pesticides; allows consideration of storage in reservoirs. Watershed is divided into overland flow and channel segments, with the ability to store and release water in reservoirs.

Parametric Models

WBNM2000: Useful for urban watersheds with easy specification of alternative stream flow paths and detention basin