

BOOK REVIEWS

T. D. Prowse and C. S. L. Ommaney (Eds) 1990 NORTHERN HYDROLOGY CANADIAN PERSPECTIVES National Hydrology Research Institute Report No. 1, N.H.R.I., Inland Waters Directorate, Environment Canada. ISSN 0843-9052, ISBN 0-662-17-76-8, xvi+308 pp.

This book consists of a series of review articles by Canadian authors covering broad areas of northern hydrology. The writers were asked to adhere to a general structure comprising introduction, historical background, current research and future research needs. While this produces consistency and breadth, it also inhibits some contributors from developing major themes of interest.

Prowse sets the scene in Chapter 1 with a wide-ranging and scholarly article. He reviews previous definitions of the "North" and as a guideline definition settles on the 60°N latitude which coincides with the boundary between the territories and the southern provinces. He concludes the chapter by noting the importance of northern studies for global change research while noting that the research effort has been relatively small. The second chapter by Marsh deals with snow hydrology; it is the most technical in the collection and makes a useful contribution to snow hydrology. Major emphases include problems of underestimating snowfall accumulation, extending point energy-balance estimates of snowmelt to broader areas, and assessing pathways of snowmelt run-off in larger basins.

Permafrost hydrology is covered in two chapters. First, Woo concentrates on the influence of permafrost on stream flow, water balances, hillslope hydrology, and lakes and wetlands. Second, van Everdingen examines the effects of permafrost on groundwater hydrology including recharge, discharge, chemical properties and its significance as a resource.

Chapter 5 by Gerard on floating ice shows how research emphases have shifted from flood-related problems to more recent studies of low flows. In his review of glacial hydrology, Young notes that over 40 Canadian glaciers have significant mass-balance or hydrological records, though about half of these are located south of 60°N in the Canadian cordillera. He notes, however, that data collection has tended to outweigh analysis, and several important questions such as the representativeness of representative basins remain to be addressed.

Water quality research is reviewed by Gregor who comments on the inadequacies in data networks and the importance of atmospherically derived pollutants from distant locations as sources of river and lake pollution. In Chapter 8, Rouse examines the regional energy balance, mainly by reference to a large number of point estimates. He notes that "... energy budget studies at a point, taken for their own sake, have or should have largely ended." Regional hydrology is discussed in Chapter 9 by Wedel who outlines attempts to model large basins by both private and government agencies.

The final chapter on management north of 60°N by Gibson understandably bears less resemblance to the editors' outline than previous chapters. The historical background and future needs receive relatively scant attention compared to the emphasis on present day concerns such as legislative frameworks, licensing authorization, data collection and planning. Specific concerns discussed include the effects of mine abandonment, transboundary issues and aboriginal land claims.

The volume is hardbound and neatly produced in a small format, though some of the diagrams and tables are over-reduced as a result. References are consolidated into a single 60-page list and comprehensive lists of symbols and abbreviations are included.

Although much of the material in this volume may be of marginal interest to New Zealand hydrologists, it represents a valuable compendium of hydrological research and should be in the libraries of all research institutions.

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HYDRAULIC ENGINEERING: SOFTWARE APPLICATIONS, Editors: W. R. Blain and D. Ouazar. Proceedings of the Third International Conference on Hydraulic Engineering Software, Massachusetts, USA, April 1990.

The book contains edited papers submitted to the 3rd International Conference on Hydraulic Engineering Software organised by the Wessex Institute of Technology. There are six sections:

- Hydrodynamic and Environmental Modelling
- Pressure Flow
- Open Channel Flow and Dam Breaking
- Hydrology and Groundwater Flow
- Data Acquisition, Monitoring of Experiments
- Hydraulic Software and Expert Systems

Within each of these sections there are up to 8 papers. The thrust of the papers varies widely with some concentrating on the mathematical development of algorithms, some on computer science and others on applications.

For example, the first paper describes the mathematical development of a finite element model for a 2-D wave equation with no explanation as to what application this particular formulation would have, while the second paper describes the application of a model to simulate circulation in a small lake with only a cursory explanation of the model itself. This book thus has limited value as a text on hydraulic engineering software because it lacks a common thread. However, the book has definite value as a repository for the individual papers.

Several of these papers present new technology in the form of fuzzy logic, expert systems and pointer-based architecture (PBA). The paper on pointer-based architecture by N. E. Jensen of the Danish Hydraulic Institute (DHI), is one of the highlights of the book. It describes how the Institute uses pointer-based matrix solvers instead of the traditional index-based solvers (used by FORTRAN programmers) for such DHI programs as MOUSE and MIKE-II. The savings in computer time using pointer-based architecture are considerable, although it requires more storage.

Another highlight is the final paper in the book by S. Mohan of the Indian Institute of Technology entitled "Expert system for reservoir operation". It contains a lucid description of expert systems and the development of such a system for the operation of Krishnagiri reservoir system in India.

This book is not one that computational hydraulic engineers would need on their bookshelf, but having access to it in a library would be valuable.

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GROUNDWATER GEOMORPHOLOGY: THE ROLE OF SUBSURFACE WATER IN EARTH-SURFACE PROCESSES AND LANDFORMS, Edited by C. G. Higgins and D. R. Coates (1990). Geological Society of America Special Paper No. 242, P.O. Box 9140, Boulder, Colorado 80301, 368 pp (US \$60).

This is a collection of 17 papers by different authors on erosion and landforms that are either created or initiated by groundwater seepage. The authors in this volume were selected by the editors in "a deliberate attempt to provide a systematic survey of the whole field. In so doing, specific subjects were identified and particular knowledgeable authors were asked to write about them." As with any volume composed of invited contributions from several authors, there is a wide range of style and approach. However, the editors state that "despite this variability, most chapters provide an overview of the subject; a discussion, with examples and case studies of important research; and finally a summary or conclusions. Some chapters stress the broad survey, others emphasize current or original research on some specific aspects." An introductory chapter by Tom Dunne provides some basic information on hydraulics of subsurface flow and the geomorphology of the resulting erosion.

One of the authors defines geomorphology as "the study of landforms and those processes and surface materials involved in topographic transformation." Thus, the papers contain many photographs and detailed description of topics such as downslope movement, piping, gully development, pseudokarst erosion, erosion in Karst aquifers, erosion in cold regions caused by freezing and thawing of groundwater, land subsidence and earth-fissure formation caused by groundwater abstractions, valley development caused by groundwater-induced erosion around valley boundaries, erosion of seacliffs by groundwater, erosion by groundwater in the submarine environment and the role of groundwater in fluvial processes. The treatment is almost entirely descriptive since most phenomena discussed in these papers are too complicated to be described quantitatively with present-day knowledge. The photographs and descriptions are clear and should be of great interest to geologists, engineers and outdoor-oriented people who would like to learn a little more about some of the topographical features encountered in their wanderings.

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