BOOK REVIEWS

HYDROLOGY AND WATER RESOURCES IN TROPICAL REGIONS (DEVELOPMENTS IN WATER SCIENCE 18). by Jaroslav Balek; 1983. Elsevier Science Publishers, B. V. Molenwerf 1, Amsterdam, The Netherlands. 271 p. (Price $US 64.00).

Books about the hydrology and water resources of tropical regions are rare indeed and a book outlining hydrological processes, nature of the water resources, their capacity to be developed and their susceptibility to degradation in the tropics is long overdue. In his book Balek outlines his broad knowledge of tropical water resources research and development.

Chapter 1 presents an interesting historical account of the exploration and uses of the major tropical river and lake systems.

Chapter 2 dealing with tropical climatology outlines factors and mechanisms controlling climate and some of the typical features of tropical climates such as the rather high spatial and time variability of the annual rainfall. The chapter also emphasises the great diversity of tropical climates which include tropical rainfall forest climates, monsoon climates, periodically dry savanna climates, steppe climates, desert climates and highland climates.

The hydrological cycle in tropical regions described in Chapter 3 is largely concerned with the role of vegetation and vegetation changes on the water balance of tropical areas. The important and controversial question of the effects of deforestation on the water balance of tropical areas was not given very comprehensive treatment and made little or no mention of the substantial and relevant forest hydrological work from Manaus Brazil, peninsular Malaysia and northern Australia.

The characteristics of important tropical rivers and basins are outlined in Chapter 4 along with a brief account of soil erosion.

Chapters 5 and 6 describe the nature and importance of groundwater and lakes and swamps respectively in tropical areas, and emphasises in some detail the great importance of groundwater and swamps to the water economy of the tropics.

Of the hydrological extremes which influence the tropics it is drought, not floods, which often most seriously affects societies. The problems of defining droughts, studying their statistics and developing drought forecasting methods are treated by Balek in Chapter 8.

The final chapter is concerned with the development of water resources and their pollution within the framework of the environments, landuses, legislative policies and existing hydrologic data pertaining in tropical regions.

Balek's book is not a standard hydrology text book. Rather, Balek has adopted a geographical approach to describe complex tropical water resource systems in terms of climatology, hydrology, ecology and human influences. The overall presentation is somewhat marred by the fragmentary treatment of landuse hydrology and water balances in Chapters 4 and 5 and the lack of sound explanations of some described hydrological phenomena. There is also a surprising number of typographical errors. Nevertheless, the book is interesting and is undoubtedly a valuable contribution to an area of water science about which little has been previously published. *C. L. O'Loughlin*

HYDROLOGY IN PRACTICE by Elizabeth M. Shaw. Van Nostrand Rheinhold Co. Ltd, Wokingham, England, 569 p. (£18.50 hardback £9.75 paperback)

In her preface, the author explains that *Hydrology in Practice* "attempts to bridge the gap between the text concerned with scientific processes and the applied numerical text". The text "is addressed primarily to civil engineering undergraduates", and "although presented from a British viewpoint, the subject is set in a global context". The above remarks serve as pointers to some of the strengths and weaknesses of *Hydrology in Practice*. The book is very much an introductory text, there is emphasis on the British scene, and an effort is made to achieve a balance between theory and application. I will attempt to describe something of the structure and content of *Hydrology in Practice* , and will point out examples of what I can see as strengths and weaknesses of the book.

The basic outline of the book is a novel one, as far as hydrology texts go. The book is divided into three overall sections. Part 1, Hydrological Measurements, takes eight chapters to describe hydrologic instrumentation and data collection procedures for rainfall, runoff, soil moisture, groundwater and evaporation. There are even chapters devoted to hydrologic networks, water quality, and data processing. Parts 2 and 3 form the core of the analytical and applied aspects of hydrology. Part 2, Hydrologic Analysis, includes chapters on rainfall, evaporation, streamflow, rainfall-runoff relations, as well as a chapter on catchment modelling and a chapter on stochastic hydrology. Part 3, Engineering Applications, covers flood routing, design floods, aspects of urban hydrology, an introduction to water resources planning, and some discussions of river basin management schemes in practice in different parts of the world.

Having described the overall structure and given an indication of the contents, one must now ask : does the structure work? and what sort of balance is made between the various components? To the first of these questions I would answer that overall the basic structure of the book works well. In teaching undergraduate hydrology I am often left with the feeling that I am simply teaching a set of unrelated techniques or tools with little regard for how the data one manipulates were collected, and little indication of how the various techniques fit together in the broad context of water resources engineering. In *Hydrology in Practice* we have not only the analytical tools, but discussion of nuts-and-bolts data collection and examples of how the analyses come into play in the wider picture. The disadvantage of this approach is that when one is teaching a particular analytical tool, one finds the coverage split between two and possibly three parts of the book, so that one is constantly referring backwards and forwards to pick up different aspects of the same procedure. For example, unit hydrograph analysis is covered in Chapters 13 and 14 (Part 2), but no mention is made of synthetic hydrographs until the discussion of design floods in Part 3, where discussion is limited to the triangular hydrograph of the *British Flood Studies Report*. Reservoir capacity design is similarly split, as is flood prediction. But this poses no major difficulty, so long as one is aware of the content of the book.

A more serious criticism has to do with the balance and coverage of the

book. Inevitably any textbook with broad coverage of what is already a broad eclectic field will contain weaknesses in some areas and unevenness in depth. In this book, from my point of view, there was too much emphasis on basic, elementary tools and concepts, while more complicated topics were in some cases rushed over, discussed superficially, vaguely, and not always clearly. The detail in Part 1 (Hydrological Measurements) generally goes far beyond that normally devoted to the matters discussed there. In a sense this is refreshing and may be helpful, especially to the undergraduate who wants to see how hydrologic data are collected, a subject all too often skipped over by academics in a hurry to cover the syllabus. The basics of precipitation analysis, including methods for computing average catchment rainfall, are also covered thoroughly. But this means that coverage is abbreviated for other aspects of hydrology. The inclusion of chapters on stochastic hydrology and catchment modelling are welcome additions to an undergraduate text, but the coverage here could be greatly extended in both depth and clarity. Although broad fields are covered, when one gets down to the question of doing even introductory calculations there is no clear guide and few detailed examples. Similar criticism applies to the chapter on groundwater, in which conditions on applications of of the equations are not carefully discussed. Figure 7.2 contains sample hydraulic conductivities but with no units. The discussion of Eq. 7.10, the basic equation for unconfined aquifers, implies that the equation holds for an anisotropic aquifer without mentioning that the coordinate axes must coincide with the principal axes of the permeability tensor. The brief and shallow introduction to finite difference techniques makes no mention of boundary conditions. No numerical examples are worked on groundwater. Examples are worked for many other topics however, and there are problems in the back of the book for each chapter. But in many cases methods or explanations could be clearer. In the example for soil moisture deficit accounting, use is made of Grindley's (Gt. Britain Meteorological Office) tables for actual evapotranspiration for two values of Penman's root constant. No mention is made, however, of how the tables were derived or of the fact that from one table one can easily derive other tables for any given root constant. In the chapter on design storms, the *Flood Studies Report*'s relation between return period of storm and return period of flood is simply presented, with no critical discussion of what is in reality a very important and rather controversial issue.

In summary, I found *Hydrology in Practice* to be an interesting and often helpful contribution to the set of textbooks for undergraduate hydrology. The scope of the coverage is broad and does include some relatively recent developments, but depth of coverage is uneven and at times uncritical. The level of presentation is generally elementary, as intended, and the focus is strongly on the British scene, also as intended. I would recommend this book as complementing other texts used to teach undergraduate hydrology.

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