BOOK REVIEWS

Kinematic Hydrology and Modelling—by David Stephenson and Michael E. Meadows. Elsevier Science Publishers B.V., P.O. Box 211, Amsterdam, The Netherlands, 1986. 248 Pages.

In recent past, the Kinematic Wave Theory has emerged as a powerful tool in hydrologic computations. Its applications in the field surface runoff and travel of flood waves have been found to be of particular significance. The mathematical formulations of this theory being difficult and dependency of their solution on digital computer made its popular use in the past quite limited. However, the author's have claimed that 'the book is aimed at both the theoretician and the practitioner. Thus, the mathematical sections are useful if modelling is required, but the Chapters on design charts could be read with very little mathematical understanding.....'. The authors' efforts are welcome so far as application of Kinematic Wave theory to different field problems in Hydrology are concerned.

The first two chapters are devoted to general hydrological concepts and introduction to Kinematic Wave theory. The third chapter which deals with the hydrograph shape and peak flows off a plane would be of interest to those dealing in small watersheds.

Kinematic wave assumptions, formulations and their numerical simulations have been discussed in chapters 4 and 5. The Chapter 6 is devoted to dimensionless hydrographs which accounts for the unit hydrograph theory. The study deals with three types of catchments viz. a sloping plane catchment, converging surface catchment and v-shaped catchment with stream.

Kinematic equations for non-rectangular sections have been discussed in Chapter-8 which is devoted to conduit flows. Idea can be had about the application of this theory to flows in sewer pipes and trapezoidal surface channels. The problems of urban hydrological management are taken up in Chapter-9.

Kinematic modelling and its applications to watersheds have been discussed in chapter 10 and 11. A brief reference to Ground Water Flow Problems is made in the last Chapter.

All the Chapters described give a coverage on an average in 20 to 25 pages. The authors have touched a number of hydrologic problems to which kinematic wave theory can be applied. It is a good book for the beginners as a number of illustrations and solved examples are given alongwith some of the computer programmes. However, it may not satisfy the researchers as well as those field engineers who seek solutions for complex field problems. The book has been printed on typescript printing. Letters are small, thin but clear.

B.S. MATHUR
Prof. & Head
Department of Hydrology
University of Roorkee
Roorkee-247667 (U.P.)

Non-Linear Statistical Models—by A. Ronald Gallant. John Wiley & Sons. Inc., 1987. 610 Pages.

Mostly natural phenomena and also economic processes etc.. where statistical analysis is extensively employed, are nonlinear. These are assumed as linear for the sake of simplification and ease in analytical computations. With the availability of high speed digital computers and advances in statistical and probability theory it has now become possible to adequately deal with non-linear processes. The author has dealt with the complex subject of non-linear statistical models in a comprehensive manner. The three major categories of statistical models viz. univariate regression models, multivariate regression models and simultaneous equations models have been covered. The emphasis has been laid on methods, theory and computations. The author has dealt with the subject matter at the state of art level. Particularly, the chapter dealing with unified asymptotic theory for dynamic non-linear models is at the frontier.

The other important topics covered include univariate non-linear regression, unified asymptotic theory of non-linear models and non-linear simultaneous equations models. The author recommends use of standard statistical packages such as SAS. Computational examples consist of figures displaying a few lines of SAS code and the resulting output.

The book is of advanced level and would provide useful information for researchers in this area.

S.M. SETH
Scientist 'F,
National Institute of Hydrology
Roorkee-247667 (U.P.)

Artificial Recharge of Groundwater—Edited by Takashi Asano Butterworth Publishers, 1985, Pages 767.

Artificial recharge of ground water is becoming increasingly important in ground water management and in conjunctive use of surface water and groundwater resources. Artificial recharge is used to reduce or even reverse the declines of groundwater level. It enables storing of surplus water from streams in the aquifer and to use it at the time of need. Groundwater recharge is also an important measure for protecting fresh ground water in coastal aquifers against intrusion of salt water from the sea. Another application of groundwater recharge is to treat waste water as the vadose zone and the aquifer act as natural filters for chemical and biological purification of the water.

The book entitled Artificial Recharge of Ground water edited by Takashi Asano has enlighted many technical issues related to artificial recharge of ground water. Several well known authors have contribution in this book. The editor has summarized the state of art of artificial recharge of groundwater. The various chapters cover fundamental aspects of groundwater recharge, role of artificial recharge in groundwater basin management, recharge methods, implementation of groundwater recharge with reclaimed waste water, health effects of waste water reuse in groundwater recharge, artificial recharge operation, contaminant removal by soil system and fate of micro pollutants during groundwater recharge, legal and economic aspect of groundwater recharge. Also some important case studies of groundwater recharge have been included.

Infiltration and redistribution phenomenon for prediction of recharge rate in semi arid region, evaluation of recharge from river hydraulically connected with aquifer, recharge through multiaquifer system, water quality and health aspects of the reclaimed water are some of the advanced research areas pertaining to artificial groundwater recharge have been focussed in the book. The book has been written for civil engineers, sanitary engineers, agricultural engineers, hydrologists, environmental scientists and research scientists working in the area of groundwater.

G. C. Mishra
Scientist 'F'
National Institute of Hydrology
Roorkee-247667 (U.P.)

Handbook of Applied Meteorology—by David D. Houghton (Editor). John Wiley and Sons, Inc. 605, Third Ave., New York, NY 10158, 1985. Pages 1461, Price $ 90.00

The Handbook is a good reference source for all meteorologists engaged in the application of meteorology to aviation, water resources, marine and agricultural activities. The book edited by David H Doughton of University of Wisconcin consists of 46 articles contributed by academecians and researchers in the respective areas. Besides, a glossary and climatic data of a number of observatories over the world have been provided.

The Handbook has been divided into 5 parts, the largest of them being Part III on 'Applications', Among others, Part I deals with fundamentals of meteorology and Part II is on Measurement including observation techniques. The later parts, Part IV and V are general in nature and deal with social impacts and resources. The resources part deals with data, books and journals, education, research and libraries.

The all important part on 'Applications' has four articles of direct relevance to Hydrology. Krishan P. Singh of the Illinois Department of Energy and Natural Resources contributed two articles on floods and water management. The article on runoff is by Michael L. Terestriep. The fourth was on Evaporation and Transpiration. Besides, two articles on Agriculture and Forestry could be of interest to hydrologists. Looking at the title of the book one would expect a good coverage of methods of hydro-meteorological analysis relating to runoff and flood estimation. However, there is no coverage of methods dealing with estimation of areal precipitation, depth-duration or depth-area-duration analysis and design storm estimation.

The absence of articles dealing with snow or snowmelt floods is surprising. Likewise the article on observational networks has not dealt with the network design of precipitation gauge adequately.

K. S. RAMASASTRI
Scientist 'E'
National Institute of Hydrology
Roorkee – 247 667 (U.P.)

Measuring Water Quality Benefits —by V. Kerry Smith and William H. Desvousages. Kluwer Nijhoft Publishing, Boston, 1986. pages 327, Dfl 155.00.

In this book the efforts are organized around the task of measuring the recreation and related benefits of water quality improvements of the Monogahela River in Pennsylvania, U.S.A. Two approaches have been used, travel cost and contingent valuation, that are well suited for measuring recreation benefits.

Using the implicit prices individuals incur to visit recreation sites, the travel cost approach, indirectly infers the recreation benefits of water quality improvements from the observed behaviour (visits). Contingent valuation, by contrast, uses survey methods to directly ask individuals to express their preferences for the improved water quality. By applying alternative approaches in a case study of a single site, one can compare their relative performance, as well as evaluate the assumptions required by each.

This book ties together research conducted at varying rates of intensity over a 5 year period. The activities address five objectives that relate to measuring the recreation and related benefits of improved water quality.

* Develop a consistent conceptual framework for defining and measuring both use and nonuse benefits.
* Evaluate the theoretical assumptions required to use the travel cost model to estimate the demand for recreation sites.
* Include the effects of site characteristics within a theoretically consistent travel cost model of recreation demand.
* Conduct a contingent valuation survey to measure the use and nonuse recreation benefits of water quality improvements and to evaluate the importance of different issues related to using surveys.
* Compare two approaches for measuring benefits-the travel cost (the indirect approach) and the contingent valuation (the direct approach).

Chapter 2 reviews the conceptual basis for monetary measures of changes in an individual's well being. It discusses the theoretical basis for use and nonuse values, as well as the important implications of the treatment of uncertainty for each. Chapter 2 also briefly describes the approaches for measuring benefits. Chapter 3 describes the area, its features, and the socio-economic profile of the resident population in late 1981 when survey was completed. It also outlines survey pocedures, offers some comparative evidence on the performance of the survey instrument, and, finally, describes the characteristics of our sample of households. Chapter 4, the second contingent valuation chapter, covers a lot of territory. It begins with a precise of the knowledge about how contingent valuation performs in valuing nonmarketed environmental resources. As such, it distills the Cummings, Brookshire, and Schulze (1986) appraisal of contingent valuation, along with other recent research. This distillation depicts the issues that must be addressed in using contingent valuation for benefit estimation. While our survey was conducted before some of

the other research reviewed in this chapter, we have reflected our understanding of this research in the further analysis of our survey results presented in Chapter 4. Chapter 5 extends the contingent valuation analysis of discussing option values of improved water quality. Option value is the difference between the maximum amount an individual would pay for a water quality improvement when his future use is uncertain and the expected value of the benefits he would realize from his actual uses of the improved water. Chapter 5 places conceptual and empirical findings in perspective with the recent research. Chapter 6 concludes the discussion of contingent valuation. It describes an alternative way to elicit valuation information with surveys–contingent ranking. Given the growing interest in the method for benefit measurements, Chapter 6 describes the theoretical structure and empirical experience with contingent ranking. Moreover, it reports our experience with contingent ranking in the Monogahela case study.

The next three Chapters–Chapters 7, 8 and 9-describe research with the travel cost model, an indirect method that uses observed household behaviour to measure the recreation value of water quality improvements. These three chapters combine to consider the theoretical and empirical issues in developing a generalized travel cost model of recreation demand that is capable of valuing changes in the characteristics of recreation sites–with water quality being the characteristics of interest. Chapter 10 follows to compare the contingent valuation and travel cost approaches to estimate the recreation benefits of water quality improvements. Chapter 11 draws together the findings from conceptual and empirical analysis. It considers the implications of findings for further research in measuring the benefits from improvements in enviromental quality, especially water quality and concludes with a discussion on using benefits analysis in policy applications.

As stated in the first paragraph of this review, the scope of the book is limited to experiences of a limited time study on a typical river. Thus, it is written more for a specific user than a general research worker working in the area of water quality. Thus, it is a good source for persons working on a typical river system which has been very well exploited for water. However, its applications for researchers in India would be to limited extent. The book may be helpful for post graduate students in Environmental Engineering as a reference text, however for undergraduate students it may not be of much use. The book is written in simple and lucid style and narrates vast field experiences.

K.K.S. BHATIA
Scientist 'E' & Head
Man's Influence Division
National Institute of Hydrology
Roorkee-247667 (U.P.)

Facets of Hydrology II—by John C. Rooda (Editor). John Wiley, New York, 1985. Pages 447

This book consists of essays written by experts in their own fields dealing with the problems of surface water hydrology. The article on Remote sensing for Hydrological Forecasting covers in detail the real time measurements of precipitation using remote sensing although it could have also covered its application for forecasting of rainfall. The chapter on Automatic Weather Stations covers various automatic techniques available for collecting weather data. The utility of this chapter would have been enhanced had it also covered the use of microcomputers to collect and analyse

weather data on real time basis. The topic of Acid Deposition has been well presented in chapter 3 indicating many side effects upon soil and wildlife. The subject of weather modification has been presented in a broad sense in chapter 4 indicating its potential use due its impact from socio-political considerations. The chapter on Water Resouurces Systems and Climate change presents the impact of the climate on water resources systems and modelling of the influence of climate variations on runoff. Although a lengthy discussion has been presented about lakes in general in the chapter on lakes : Their Physical Aspects, the aspect of dynamics of lake behaviour needed for evaporation studies has not been discussed in detail.

The chapter on the sediment Loads of River introduces sediment water relationships and current problem areas in the theory. This chapter is useful to those who are familier with the current instrumentation techniques of sediment water mixture measurement. The topic on Aspects of Arid Zone Hydrology has touched upon various aspects of Arid Zone hydrology without much detail. The topic on time in hydrology covers the role of time in dealing with short term and long term phenomena in hydrology. This topic is of general interest to any hydrologist. The topic on the Evaluation of Hydrologic Data Networks is very useful for those dealing with the data network development. The topic on strategies for water quality monitoring presented in chapter 11 would have been useful with illustrative examples. The article on Large Scale Water Transfer is useful as it presents a good over view and many case histories of interbasin water transfer. Chapter-13 dealing with the topic of Technology Transfer in Hydrology gives information regarding various government agencies involved with hydrological problems and regarding the transfer of information between agencies. This topic is useful for those involved in technology transfer activities in the area of hydrology. Overall, this book is useful for those who are involved in surface water hydrology studies and want to update their knowledge.

M. Perumal
Scientist 'C'
National Institute of Hydrology
Roorkee-247667 (U.P.)