

## Book reviews

### **CALIBRATION AND RELIABILITY IN GROUNDWATER MODELLING: A FEW STEPS CLOSER TO REALITY**

K. Kovar & Z. Hrkal (eds). International Association of Hydrological Sciences, 2003. ISBN 1 9015 0207 4, £78.80, 526 pp.

The text contains proceedings of the International Conference on Calibration and Reliability in Groundwater Modelling (ModelCARE 2002) that was held in June 2002 in Prague, Czech Republic. There are altogether 68 papers which are grouped in seven sections, namely modelling concepts, stochastic modelling, parameter estimation and model calibration, conceptual model uncertainty and scale, reliability of model prediction, comprehensive use of field information, and methods and tools for assessment of well-head protection zones. The spread of authors of the papers is quite impressive, ranging from eminent scholars to young and emerging researchers in deterministic, stochastic and probabilistic groundwater modelling. Of the 68 papers, 60 of them, or 88%, addressed the conference themes of assessing the reliability of the results from models due to model mismatch with problem statement, spatial and temporal variability of medium parameters, incomplete description of geometry, initial and boundary condition and system stresses, and errors associated with field measurements. With that high percentage of papers addressing the themes of the conference, the editors must be commended for pulling together a unified body of knowledge that addresses some of the difficulties of modelling a 'hidden' resource like groundwater and substances that it contains and transports.

How much closer to reality are we in terms of modelling various processes in groundwater systems is difficult to assess from the proceedings. What is clear from the papers is that there are still modelling limitations associated with conveying results of robust stochastic approaches of modelling groundwater to practitioners and wider society, despite the fact that they assist in giving better representations of inherent uncertainties of various aquifer property and transport realisations. Other papers which adopt a deterministic approach account for uncertainties as perturbations about some average realisations with assigned probabilistic values or confidence levels. It remains a thing of serious concern that these two approaches remain as divergent as their proponents. The proceedings, nor the preface by the Editors that summarises the deliberations of the conference, do not seem to indicate that the conference provided a forum for the harmonisation of these two approaches.

The coverage of the proceedings in terms of issues of hydraulic flows and contaminant transport in groundwater systems is quite broad. This is quite commendable, and it indicates that researchers are giving balanced considerations to these two issues. Although there are a number of reported case studies, some of the papers only addressed hypothetical examples, which do not take us closer to reality.

It is worth pointing out that only the paper by Teutsch and Finkel explicitly incorporated economic and financial considerations into the modelling efforts for contaminant transport within the framework of a decision support system. Even at that, the authors limited themselves only to the pump-and-treat plume management approach and, probably for reasons of model complexities, failed to consider other source and plume management options.

I commend the editors for ensuring that most of the papers addressed the themes that they set themselves to addressing. In that respect, the proceedings of ModelCARE 2002 provide a comprehensive body of knowledge in addressing modelling of groundwater systems under uncertainty conditions.

AKPOFURE E. TAIGBENU

### **TURBULENT JETS AND PLUMES: A LAGRANGIAN APPROACH**

J. H. W. Lee and V. H. Chu (eds). Kluwer Academic, 2004. ISBN 1 4020 7520 0, £83.00, 408 pp.

Jets and plumes, embodying free shear turbulence, have attracted great attention due to the development of environmental hydraulics, which concerns pollutant mixing and dispersion from outfall discharges as well as other sources. Classical laboratory results are often limited by their simple geometry, and expert systems such as Cormix have been developed to handle a wide variety of flow parameters in real applications, from density stratification to different types of outfall configuration. Recent advances in computational fluid dynamics (CFD) techniques have also empowered researchers to explore jets and plumes using various tools of turbulent modelling, large eddy simulation (LES) and direct Navier–Stokes (DNS) equation simulation. In spite of all these developments, academic research and engineering solutions do not seem to have converged; instead, the gap

between them has grown wider since it is very difficult for engineers to collect the large amount of research results and to use them appropriately in their practical problems.

It is therefore fortunate that the editors, who are among the few internationally recognised experts in this subject area, have presented this new book. The first editor, Professor J. H. W. Lee, has devoted great effort to providing applicable tools for engineers to cope with recent rapid advances in techniques and increasing demands on engineering practice. Together with the second editor, Professor V. H. Chu, he has also conducted much excellent fundamental research work in this area. It is worth mentioning that Professor Chu is one of the pioneers in developing understanding of shallow-water hydrodynamics.

Based on well-known integral methods, the successful introduction of the Lagrangian approach to jet and plume problems has certainly advanced this research area. The research results have been implemented in the development of software tools such as VISJET and JETLAG which are very useful in solving practical problems. In addition to the new Lagrangian approach, VISJET was developed with the latest computer techniques for visualisations, which have been demonstrated to be very straightforward and convenient. The publication of this book is indeed a major step forward for this subject area.

It is very impressive that this book has covered a wide range of topics associated with jets and plumes. Indeed, most fundamental research results in this subject area have been summarised in the book. Some original research results on advected puffs and thermals have also been included. It starts from a stagnant uniform environment followed by density stratification. Subsequently, the co-flow and cross-flow environments have been covered intensively. Each specific case has been examined from different angles: visualisations, basic equations, integral models and numerical simulations (one-, two- and three-dimensional).

Throughout the book, fundamental principles have been clearly and logically presented. Practical problems have been used extensively to support the delivery of the ideas and to demonstrate various applications of the Lagrangian approach. I strongly recommend this book as an ideal choice of textbook for senior undergraduates and postgraduates in environmental hydraulics, water resources and relevant subjects. Equally, it is a very useful reference for practitioners.

DAOYI CHEN

### **LONG-TERM BENEFITS AND PERFORMANCE OF DAMS**

H. Hewlett (ed.). Thomas Telford, 2004. ISBN 0 7277 3268 4, £90, 684 pp.

This book is the proceedings of the 13th Conference of the British Dam Society held at the University of Kent, Canterbury, UK, in June 2004. The volume contains 55 papers, divided into six sections: Benefits and Social Impacts, Use of New Materials, Risk Assessment and Reservoir Management, Flood

Impact and Alleviation, Instrumentation and Monitoring, and Incidents and Rehabilitation. The editor and conference paper review committee have done an excellent job in structuring the volume. The individual papers are well written and the book is cohesive despite more than 120 contributing authors. The average paper length exceeds twelve pages allowing greater technical depth than is usual for conference proceedings.

The first section provides an historical perspective of the role of dams in society and an example of a dam developed for recreational purposes. These papers are balanced by three papers that review the fate of the World Commission on Dams Report (2000), the perspective of WWF International and a fascinating discussion of the political ecology of dams in Teesdale, northern England. These five papers create a diverse basis for the global debate on dams.

The discussion of new materials is covered in just five papers. The treatise focuses primarily on geomembranes at specific sites and reviews of the performance of various treatments during the past 25 years. The focus of the remainder of the text is on risk assessment, reservoir management and documenting incidents and rehabilitation case studies. The importance of dam safety to society, particularly in an era of security concerns is very timely. Assessment methodology and example applications are presented from across the globe – including extensive coverage of European countries, Sri Lanka, Kenya and Iran.

Several authors articulate the importance of not just collecting data to monitor the structural performance of dams, but demonstrate different approaches to processing and reporting information to decision-makers. For readers interested in seismic assessments of dams, several authors provide review papers for different countries and there are also interesting summary papers on European research related to dambreak analyses and large-scale field tests of dam failure.

The book concludes with eighteen papers on incidents and rehabilitation case studies. Although some of the documented cases are small scale (and in one case anonymous!), there is a wealth of experience and practical knowledge about what can be achieved and what is infeasible.

The reader is left to ponder the role of the engineer. The benefits of dams and engineering management are well addressed, but dams continue to be one of the most influential features in our landscapes, often casting deep divisions within communities. The leadership role of the engineer in society necessitates a broad independent view of dams and important societal aspects such as conflict resolution, re-operation studies for restoring floodplain function or downstream flows, dam de-commissioning, cumulative ecological assessments and mitigation, alternative analyses, cost-benefit studies that incorporate cultural and ecological factors, and adaptive management of dams are only mentioned briefly. Overall, though, the book provides a current engineering perspective of dam management. It is a useful reference volume with engineering methodologies and important case studies for agencies, consultants and educators.

PETER GOODWIN