Hydraulic Engineering Software IV

Computer Techniques and Applications

Editors: W.R. Blain, Wessex Institute of Technology,
University of Portsmouth, UK
E. Cabrera, Universidad Politecnica de Valencia,
Spain



6914

Computational Mechanics Publications Southampton Boston

Co-published with

Elsevier Applied Science London New York





W.R. Blain Wessex Institute of Technology University of Portsmouth Ashurst Lodge Southampton SO4 2AA UK E. Cabrera Universidad Politecnica de Valencia Apartado Correos 22012 46080 Valencia Spain

Co-published by

Computational Mechanics Publications Ashurst Lodge, Ashurst, Southampton, UK Computational Mechanics Publications Ltd Sole Distributor in the USA and Canada: Computational Mechanics Inc. 25 Bridge Street, Billerica, MA 01821, USA

and

Elsevier Science Publishers Ltd Crown House, Linton Road, Barking, Essex IG11 8JU, UK

British Library Cataloguing-in-Publication Data

A Catalogue record for this book is available from the British Library

ISBN 1-85166-789-X Elsevier Applied Science, London, New York

ISBN 1-85312-202-5 Computational Mechanics Publications, Southampton

ISBN 1-56252-128-4 Computational Mechanics Publications, Boston, USA Set:

ISBN 1-85166-852-7 Elsevier Applied Science, London, New York

ISBN 1-85312-174-6 Computational Mechanics Publications, Southampton

ISBN 1-56252-103-9 Computational Mechanics Publications, Boston, USA

Library of Congress Catalog Card Number 92-71164

No responsibility is assumed by the Publishers for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein.

©Computational Mechanics Publications 1992

Printed and bound by Billings & Sons Ltd, Worcester

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.

CONTENTS

SECTION 1: ENVIRONMENTAL ENGINEERING	
Water Quality Modelling Illustrated by a Case Study A. Cerić, N. Galić, A. Šuvalija	3
Modeling Nitrogen Species Transformations and Transport in the Unsaturated Zone Considering Temperature and Water Content Effects F. Padilla, O. Camara, D. Cluis	15
PANACHE: An Interactive Software to Simulate Steady-State Two-Dimensional Transport-Diffusion of Pollutants in Rivers Using a Particle Tracking Method M. Montminy, M. Leclerc, G. Martin, P. Boudreault	27
Solving Stochastic Environmental Models Using Decomposition Method P.A. Zielinski	39
Pollutant Transport Modelling for a Complex River System JC. Yang, HP. Lee, JH. Chang	49
Long Term Environmental Simulation L. Traversoni	61
The Effect of Reservoirs on the Thermal Behaviour of a River. Application to the Ebro River J. Puertas, D. Niñerola, J. Dolz	71
SECTION 2: PHYSICAL AND NUMERICAL FLOW MODELLING	
FEM Fluid Element Using Displacements as Nodal Variables M.F. Yeo, L.J. Schmid	87
Modelling Separated Flow in a Circular Reservoir Using Discrete Vortices R.W. Barber	97
Transition to Chaos in the Oscillatory Flow Around a Circular Cylinder G. Vittori, P. Blondeaux	109
Two-Dimensional Characteristics Finite Element Schemes for Advection-Dominated Flow Problems K. W. Characteristics Finite Element	123

Comparison of BEM Results with Model Experiments for Free Surface Porous Media Flows T. Ryl, V. Halek, E. Bruch, B. Mergeai, A. Lejeune	133
Interactive Graphical Modelling Concept for Two Dimensional Flow M. Feist, KP. Holz	143
Mathematical Modelling of Flow Patterns J. Östberg, N. Johansson	153
One-Dimensional Unsteady Flow Simulations in Nets of Variable Cross-Section Arms: Comparison Between Finite Element Method and Method of Characteristics Th. Pochet, M. Pirotton	165
Numerical Analysis of Incompressible Fluids with Uneven or Moving Boundaries Y. Mizuta	177
Comparison of Pseudo-Viscosity Model and k - ε Turbulence Model in 2-D Depth-Averaged Flow Computations T. Tingsanchali, K.R. Rahman	189
Numerical Modelling of Flow in a Storage Tank D. Dartus, B. Le Guennec	201
A Douglas-Wang Approach for Advection-Diffusion Transient Problem A. Khelifa, JL. Robert, Y. Ouellet	209
Numerical Modeling of Flow Around Spur Dikes K.W. Khan, M.H. Chaudhry	223
Numerical Analysis on Air Water Two-Phase Flow through Sandy Soil T. Sato, T. Uno	237
General Circulation Modelling in Shallow Water Problems with Data Assimilation M.M. Cecchi, A. Pica	249
SECTION 3: OPTIMIZATION	
Optimal Control of Waste Water Flow in Sewerage Systems S. Spielvogel, J. Edenhofer	265

Joint Optimisation of Annual Water Allocation and Monthly Operating Policies for Fairbairn Reservoir, Queensland, Australia K.S. Tickle, I.C. Goulter	277
Multi-Objective Optimal Schedule Model and Software for Multi-reservoir Flood Control System Y. Wang, S. Wang, X. Su	289
Optimization Model for Water Distribution Systems Design G.C. Santana, S. Soares	299
An Expert Network Flow Algorithm for Optimal Deterministic Multireservoir Operation S. Soares, M.F.H. de Carvalho	309
Optimization Methods Used in Conceptual Daily Rainfall Runoff Models NL. Win, G.L. Vandewiele	319
Malflood: A Flood Control Decision Model for Malaysia S.H. AbuBakar, P.J.B. Morrell, A. Potts	329
SECTION 4: DATA ACQUISITION AND FIELD INSTRUMENTATION	
Hydrological Magnitudes and Their Transmission C. Popovska, B. Todorovski	343
Hydrometeorological Data Quality Improvement by Implementing an Autonomous Acquisition Network in Barren Areas R. Roy, R. Gauthier, M. Hétu	351
Stage-Discharge and Quality-Quantity Relationship and Trend at Gauging Stations - Calculation Method in HYDROS and STOQ H.J. Henriksen	363
Measurement and Data Acquisition on the Pressure Field in Tests Carried Out on a Reduced Model of a Stilling Basin J. Polo, L. Castillo, J. Armengou, J. Dolz	375
Deterministic Procedure for Water Level Control in a Hydrometric Network M. Baldin, M. Gonella	383

•	ogical Data Base Management System for the e of Real-Time Flood Forecasting al, M. Erlich	
SECT SYST	ION 5: HYDRAULIC SOFTWARE AND EXPERT EMS	
	A Computer Program to Describe the Operating our of Control Valves	409
Packag	A Synthetic Streamflow Generation Software e Cagherazzi, JC. Rassam, L. Carballada	421
Hydrod	ckBASIC Graphics Software for Two-Dimensional dynamic Modelling en, R.A. Falconer	433
for Wa	evelopment of an Integrated Intelligent System ter Quality and Hydraulic Modelling w, R.G.S. Matthew	445
A Com A. Gas	parative Software for Safe Yield Estimation	459
Ducts	nputer Program for Automatic Grid Generation in with Varying Cross Section and Curved Axis pisman	467
	pert System for Irrigated Crop Management han, N. Arumugam	481
Based	A Software Environment for Advanced Knowledge Models for Flood Management onso, J. Cuena, B. Reig	493
Hydro	nagement Method and Associated Software for electric Systems with One or Two Reservoirs Bourgueil, B. Blervaque	507
Model	GMS: A Graphic User-Interface for Groundwater ling ischl, A.P. Blaschke	523
Transi	te Element Object Oriented Approach for Fluid ents Analysis azar, A.R.D. Thorley, B. Akdi, M. Yzzogh	539

	The Linking of an Expert System with Numerical Models R.L.J. Nieuwkamer, L. Winkelbauer	549
	SECTION 6: COMPUTERS FOR REAL TIME CONTROL	
	The Operation of Ship Lock Models Controlled by a Microcomputer J. Rytkönen	563
	On the Design and Development of the Irrigation System Management and Operation Model (SYMO) H.B. Manguerra, R. Loof	571
	Combining Simulation Models and Knowledge Bases for Real Time Flood Management J. Cuena, M. Molina, L. Garrote	587
	An Overview of Dynamic Computer Modelling W.G. Wright, A.M. Schulte	599
•	Authors' Index	615

.