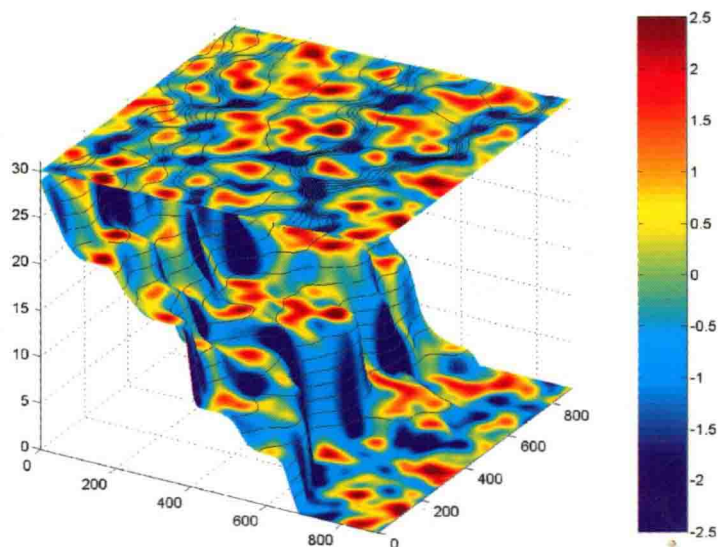


# COMPUTATIONAL METHODS IN WATER RESOURCES

## VOLUME 2

C.T. MILLER, M.W. FARTHING,  
W.G. GRAY AND G.F. PINDER



DEVELOPMENTS IN WATER SCIENCES 55

# COMPUTATIONAL METHODS IN WATER RESOURCES VOLUME 2

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DEVELOPMENTS IN WATER SCIENCES 55

COMPUTATIONAL  
METHODS IN  
WATER RESOURCES  
VOLUME 2

## **II.1 POROUS MEDIUM APPLICATIONS**

## PREFACE

Water resources are of central importance to humankind. As the world population grows and increasing incidences of pollution of surface and subsurface water resources are discovered, prudent management and protection of these resources becomes increasingly important. Natural systems are extraordinarily complicated, and the understanding and management of these resources cannot be accomplished effectively using heuristic means. In response to this problem, mathematical modeling has played a critical role in the investigation and management of water resources systems for the last three decades. The reliance on such models continues to increase at a rapid rate, and the sophistication and reliability of such models is also increasing. Researchers from around the world are engaged in the evolution of all aspects of modeling water resources systems, and these combined efforts serve all of society.

A visionary international forum was established at Princeton in 1976 to bring together researchers involved with computational methods in water resources, to foster interactions, and to catalyze new research. This initial Finite Elements in Water Resources meeting started a tradition of biennial meetings that have rotated between North America and Europe ever since. As the field has evolved, so too has the name of this conference—which is currently Computational Methods in Water Resources—reflecting a breadth of computational approaches currently being developed and applied for such problems. Conferences have been hosted at: I. Princeton (1976), II. Imperial College London (1978), III. University of Mississippi (1980), IV. University of Hanover (1982), V. University of Vermont (1984), VI. Laboratório Nacional de Engenharia Civil of Portugal (1986), VII. Massachusetts Institute of Technology (1988), VIII. Giorgio Cini Foundation of Italy (1990), IX. University of Colorado at Denver (1992), X. University of Heidelberg (1994), XI. Mexican Institute of Water Technology (1996), XII. the Institute of Chemical Engineering & High Temperature Chemical Processes—Foundation for Research and Technology, Greece (1998), XIII. The Faculty of Science of the University of Calgary, Canada (2000), and XIV. Faculty of Civil Engineering & Geosciences at Delft University of Technology (2002).

The XV International Conference on Computational Methods in Water Resources (CMWR XV) was held in Chapel Hill, North Carolina, 13-17 June 2004. The conference was sponsored by the Department of Environmental Sciences and Engineering, School of Public Health, The University of North Carolina at Chapel Hill. This two-volume set represents the reviewed and edited proceedings of this meeting, including 156 papers. In addition, many posters were presented at the meeting, which are not included in this formal written record.

These collective works include contributions by many of the leading water resources research groups from around the world. Broad in scope, these papers address numerous aspects of water resources systems, ranging from the microscale to the field scale and from the very fundamental to the most compelling and important of applications. Virtually all major classes of numerical methods for water resources problems are represented in these proceedings, from the evolution of traditional approaches to the latest in methods of recent invention. As has been traditional at past CMWR meetings, subsurface hydrology, land surface hydrology, and surface water hydrology are well represented.

The Organizing Committee acknowledges gratefully the participation of our distinguished plenary and invited speakers: Shiyi Chen, George Christakos, Olaf A. Cirpka, Clint N. Dawson, Gedeon Dagan, C.T. Kelley, Daniel R. Lynch, Dennis McLaughlin, Mario Putti, and Thomas F. Russell. In addition we thank several people that assisted with the organization of special sessions: Mark Bakker, Kathleen Fowler, Mohamed S. Ghidaoui, Markus Hilpert, Dong-Sheng Jeng, Ling Li, and Alex S. Mayer.

We are especially grateful to Randall Goodman, Rebecca R. Lloyd, Lucinda S. Thompson, and Christopher J. Windolph for their many contributions to this meeting, which required many months of their time and considerable talents. In addition, Chandra Abhishek, Deona N. Johnson, Huina Li, James E. McClure, Chongxun Pan, Joseph A. Pedit, and Carl P. Rupert, all members of Professor Miller's research group, made valuable contributions to these proceedings and provided local technical assistance associated with the meeting.

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