



Remote Sensing and Geographic Information Systems for Design and Operation of Water Resources Systems



Edited by

MICHAEL F. BAUMGARTNER

Department of Geography, University of Berne, Hallerstrasse 12, CH-3012 Berne, Switzerland

GERT A. SCHULTZ

Lehrstuhl für Hydrologie, Wasserwirtschaft und Umwelttechnik, Ruhr Universität, PO Box 102148, D-44780 Bochum, Germany

A. IVAN JOHNSON

7474 Upham Court, Arvada, Colorado 80003, USA

Proceedings of an international symposium (Symposium S3) held during the Fifth Scientific Assembly of the International Association of Hydrological Sciences (IAHS) at Rabat, Morocco, from 23 April to 3 May 1997. This symposium was jointly convened by the IAHS International Committee on Remote Sensing and Data Transmission (ICRSdT) and the IAHS International Commission on Water Resources Systems (ICWRS).

The symposium was sponsored by the United Nations Educational, Scientific and Cultural Organization, the World Meteorological Organization and the Moroccan Water Resources Association.

IAHS Publication no. 242
in the IAHS Series of Proceedings and Reports

Contents

Preface by <i>Michael Baumgartner, Gert A. Schultz & A. Ivan Johnson</i>	v
1 Water Resources Management	
Use of remote sensing data in a GIS environment for water resources management (invited paper) <i>Gert A. Schultz</i>	3
Application of remote sensing and GIS techniques for irrigable land investigation (invited paper) <i>Li Jiren, Chen Zhedan, Xia Fuchuan, Luo Jian, Wang Wen & Chen Lei</i>	17
Potential applications of satellite remote sensing (SRS) and GIS in maximizing the use of water resources in the Middle East: examining Iraq as a case study <i>Serwan M. J. Baban</i>	23
GESREAU, an institutional GIS for integrated water management <i>Pierre-André Crausaz & André Musy</i>	33
Systematic analysis model for regional water resources based on a spatial information system <i>Chun Xiuwan, Zhou Daliang, Zhou Naijun & Tan Zhongjun</i>	43
Estimation of water harvesting potential for a semiarid area using GIS and remote sensing <i>K. K. Gupta, J. Deelstra & K. D. Sharma</i>	53
The development of a customized GIS for the protection of groundwater resources in Rabat-Kenitra, Morocco <i>Peter Witt, M. El Massloughi, M. Oubalkace, M. A. Benzekri, E. Jabri, Hassan Hamdi & Scott Thorsell</i>	63
2 Snow Hydrology	
Remote sensing, geographic information systems and snowmelt runoff models — an integrated approach (keynote paper) <i>Michael F. Baumgartner & Gabriela M. Apfl</i>	73
Water storage in mountain basins from satellite snow cover monitoring (invited paper) <i>Albert Rango & Jaroslav Martinec</i>	83
Advanced analysis of snow cover based on satellite remote sensing for the assessment of water resources <i>C. Ehrlér, K. Seidel & J. Martinec</i>	93
Estimation of seasonal runoff using remote sensing satellite data <i>A. Unal Sorman & Cemal Saydam</i>	103
High Alpine snow cover monitoring using ERS-1 SAR and Landsat TM data <i>Harold Haefner & Jens Piesbergen</i>	113
The application of ERS-1 SAR for snowmelt runoff modelling <i>Thomas Nagler & Helmut Rott</i>	119
3 Surface Water and Groundwater	
Soil moisture, the hydrologic interface between surface and ground waters (keynote paper) <i>Edwin T. Engman</i>	129

Satellite rainfall monitoring: recent progress and remaining problems (invited paper) <i>Eric C. Barrett</i>	141
Conceptual modelling for surface-groundwater interactions based on hydrotopes, identified by remote sensing (invited paper) <i>A. M. J. Meijerink</i>	149
GIS-related baseflow simulation for water balance and precipitation-runoff modelling in the River Rhine basin <i>Peter Krahe, Karlheinz Daamen, Rainer Mülders & Klaus Wilke</i>	157
Climatology of rainfall observed from satellite and surface data in the Mediterranean basin <i>Luca G. Lanza & Franco Siccardi</i>	165
Hydrological design of flood reservoirs by utilization of GIS and remote sensing <i>Andreas H. Schumann & Joachim Geyer</i>	173
Monitoring of polluted water bodies by remote sensing <i>Anatoly Gitelson, Robert Stark, Gideon Oron & Inka Dor</i>	181
The application of geographic information systems to water quality monitoring <i>Michael Silberbauer</i>	189
Téledétection et système d'information géographique pour la gestion et la recherche de l'eau <i>D. El Hadani</i>	197
La télédétection, un outil pour mettre en évidence le rôle hydrologique de la végétation et des états de surface <i>Pascal Viné, Christian Puech & Jean-Michel Grésillon</i>	205
 4 New Technologies in Remote Sensing and GIS	
Airborne laser altimeter applications to water management (invited paper) <i>Jerry C. Ritchie & Mark S. Seyfried</i>	221
Microwave remote sensing and GIS for monitoring surface soil moisture and estimation of soil properties <i>Nandish M. Mattikalli & Edwin T. Engman</i>	229
On the use of informational entropy in GIS <i>Cinzia Calore, Paolo La Barbera & Giorgio Roth</i>	237
GIS topographic analysis applied to unit hydrograph models: sensitivity to DEM resolution and threshold area <i>Shadia Elsheikh & Roberto Guercio</i>	245
Access to hydrological data from GIS applications by graphical software tools — an example from the Hydrological Atlas of Germany (HAD) <i>Ralf Buskamp & Hans-Juergen Liebscher</i>	255

**Published by the International Association of Hydrological
Sciences 1997**

IAHS Press, Institute of Hydrology, Wallingford, Oxfordshire OX10 8BB, UK

IAHS Publication no. 242

ISBN 0-901502-15-5

British Library Cataloguing-in-Publication Data.

A catalogue record for this book is available from the British Library.

IAHS is indebted to the employers of the editors for their invaluable support and services provided that enabled the editors to work effectively and efficiently. Support from the Department of Geography, University of Berne, for the first editor is particularly appreciated and acknowledged.

The designations employed and the presentation of material throughout the publication do not imply the expression of any opinion whatsoever on the part of IAHS concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The use of trade, firm, or corporate names in the publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by IAHS of any product or service to the exclusion of others that may be suitable.

The editors would like to thank the many people who have helped to produce this volume. The members of the Technical Programme Committee helped with screening the abstracts and reviewing the papers. Additional extensive editing as well as the production of formatted revised papers was done by Gabriela M. Apfl and Ivan Kühnel. Special thanks go to Susan Schriber who tried to keep in touch with the authors to encourage them to meet all the necessary deadlines. Last but not least, the support of Penny Kisby at Wallingford is much appreciated.

The papers were checked and reformatted and assembled by Penny Kisby (IAHS Press, Wallingford, UK). Using files provided by the first editor.

Printed in the UK by Galliard (Printers) Ltd, Great Yarmouth.