IAHS Newsletter

NL87 December 2006

Deputy Editor – Hydrological Sciences Journal

The continuing increase in the number of papers submitted to *Hydrological Sciences Journal* (*HSJ*), and the agreement to expand the journal by ~20% in 2007, would have meant an even greater workload for the Editor, Zbyszek Kundzewicz. Hence the agreement of the IAHS Bureau at its July meeting in Paris to create the office of Deputy Editor and invite Dr Demetris Koutsoyiannis of the Technical University of Athens, Greece, to be the first in the post. *See page 3.*

Dr Demetris Koutsoyiannis

Isotopic Effects in Evaporation: scientific briefing

Hydrologists and geochemists gathered recently in Pisa, Italy, to honour and reflect on the contributions of Professor Harmon Craig to the field of stable isotope hydrology, specifically his work on the Craig-Gordon model which describes isotope exchange in water during mass transfer through the atmospheric boundary layer. The workshop, attended by 102 participants from 27 countries and three international organizations, was hosted by the National Research Council of Italy's Institute of Geosciences and Georesources, in collaboration with the IAEA, Israel's Weizmann Institute of Science, UNESCO, the IAHS International Commission on Tracers, and the University of Pisa. *See page 4.*

IAHS Scientific Assembly at IUGG Perugia, 9–13 July 2007

The deadline for abstracts for IAHS and other events at the IUGG Assembly in July 2007, and also for travel grant applications, is: 31 January 2007. Abstracts and grant applications should be submitted via the IUGG website: *http://www.iugg2007perugia.it*

IUGG takes place over two weeks, 2–13 July 2007.

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Results of the Model Parameter Estimation Experiment – MOPEX

Why should hydrologists work on a large number of basin data sets? *See page 11.*

A Note to Members

In past notes to members, I have often referred to major international meetings that I have attended, trying to identify outcomes which might be of interest to IAHS members. In recent months, however, I have not attended any such event – which has been something of a relief – and instead, from 26 to 28 September, I had the pleasure of participating in what one might call a classic IAHS meeting: the Third International Symposium on Integrated Water Resources Management (IWRM), which was held at the Ruhr University in Bochum, Germany.

This was very successful, both as regards the number of participants and the quality of the papers presented. At the request of the Convenor, Andreas Schumann, I organized a special session in which I invited representatives of a number of intergovernmental and non-governmental organizations to explain what their organizations were doing in the field of IWRM. The idea was to present the humans faces behind such well-known acronyms as UNESCO and WWC and then to invite an "exchange of views" on the subject. It is not common for such international programmes to be opened for debate by the wider scientific community and I was very grateful to my former colleagues for coming to Bochum and being prepared to explain the projects to an IAHS audience.

There was a risk that the participants attending the Symposium would not be so interested in these international programmes, but within a few minutes it became clear that there was a real desire on the part of members of the audience to learn more of what these organizations were doing and to offer advice as to how they might strengthen their activities. In the event, the session continued well into the evening, finishing only when it was necessary to leave the hall and go to dinner.

Towards the end of this debate, a young woman from southern Africa took the floor to speak in very eloquent terms of her own experience. She challenged the international community to think more carefully at how projects are launched. In recent years, internal difficulties in her home country had caused major donors to leave and very soon afterwards most internationally funded projects collapsed, with the notable exception of those that had been founded on the needs expressed by the local community rather than the interests of the donors. This brought the meeting back to the importance of local communities, and even individuals, in resolving water problems, including putting into practice those principles of IWRM, which we so often discuss and write about, but find difficult to apply in the real world.

Finally, while writing, I would like to add my own words of welcome to Demetris Koutsoyiannis as he takes up the post of Deputy Editor. It is much to the credit of Zbyszek Kundzewicz that our publication programme has grown to the extent that he needed assistance and I wish both Zbyszek and Demetris well in their work together over the coming months and years – work that is so important to IAHS in fulfilling its prime objectives.

Arthur Askew, President IAHS
arthuraskew@greenmail.ch

See the IUGG Perugia web site to check out the great programme of IAHS and other IUGG association events next July

http://www.iugg2007perugia.it

IAHS Newsletter © IAHS Press 2006

Published by IAHS Press, Centre for Ecology and Hydrology, Wallingford, Oxfordshire OX10 8BB, UK

Edited by Cate Gardner

Printed by Alden Group, Oxford, UK

IAHS is a nongovernmental scientific organization dedicated to serving the science of hydrology and the worldwide community of hydrologists.

The IAHS Newsletter is distributed free of charge to members of IAHS. This Newsletter and previous issues may be downloaded from: *www.iahs.info*

Articles and letters from IAHS members on all aspects of hydrology and related topics are welcomed for publication in the Newsletter. They should be sent to the IAHS Secretary General, preferably by e-mail to: *iahs@ensmp.fr*, alternatively to:

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Advertisements may be placed in the Newsletter, or inserts may be mailed with it, at the discretion of the IAHS Secretary General. Contact: *cate@iahs.demon.co.uk*

Next deadline for copy

Newsletter 88 will be published in March 2006; the copy deadline is 9 February 2007.

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Two new appointments

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Welcome, Demetris, as HSJ Deputy Editor

Reproduced from HSJ 51(6)

I have served the *Hydrological Sciences Journal* (*HSJ*) as Editor for over nine years, since my nomination at the IAHS Scientific Assembly in Rabat in April 1997. Recently, I have found it increasingly difficult to fulfil the obligations of being the sole Editor of the Journal and to meet the expectations of all stakeholders, while maintaining my existing duties at the Research Centre for Agricultural and Forest Environment, Polish Academy of Sciences in Poznań, Poland and the Potsdam Institute for Climate Impact Research in Potsdam, Germany. The Journal has grown considerably since 1997. Now, there are many more submitted papers to process. One should not forget the Journal's role: in line with the mission of IAHS, it is to promote the science of hydrology and to serve the international hydrological community. It is not only about selecting the good papers which can be published with minor or no modification, and rejecting those that cannot be accepted. It is most gratifying to see that some authors, often from less developed countries, benefit greatly from the constructive criticism provided by *HSJ* referees and, even if their papers are rejected, their further submissions are considerably improved. However, all this takes a lot of time, which I cannot afford.

While willing to continue as Editor of my beloved Journal, I was looking for a scientist who could share the duty with me. After careful consideration I concluded that Dr Demetris Koutsoyiannis of the Technical University of Athens, Greece, could be an optimal choice. This was based on my observing Demetris's work—as an author, a referee, and an Associate Editor. I was impressed by his extraordinary intellectual abilities and his affinity to the Journal. Despite many other obligations, he has treated *HSJ* as a high priority. Having embarked with Demetris on a small project of a joint editorial article for *HSJ*, about the peer-review system (Kundzewicz & Koutsoyiannis, 2005), which raised rich formal and informal discussion, I had no doubt that, together, we could achieve much. The idea of inviting Demetris to take on the task of Deputy Editor was endorsed by the IAHS Bureau in Paris, July 2006.

Welcome, Demetris in your new role as Deputy Editor. I wish you good luck in your new capacity and look forward to continuing to collaborate with you for the benefit of our Journal.

Zbigniew W. Kundzewicz, HSJ Editor

Grateful and apprehensive

The Editor's invitation, with the IAHS Bureau's endorsement, to become the Deputy Editor of *HSJ* is a great honour for me. I feel grateful for their trust. My honour is even greater because of the timing of my appointment. *Hydrological Sciences Journal*, the most international and the oldest hydrological journal (published since 1956) has attained a historical peak of prestige, influence and popularity. This is manifested by several objective indices. Its impact factor (IF) is now 1.606 (ISI Journal Citations Report for 2005), which places it in the top ten water-related journals. In the last eight years, this index has quadrupled. In the same period, the number of new submissions per year has doubled.

Obviously, this has not happened spontaneously. We, the readers of *HSJ*, acting also as authors and some of us as reviewers and Associate Editors, know well that, behind the promotion and advancement of *HSJ*, there are the inspired and inspiring editorial leadership and the assiduous efforts of Professor Zbigniew W. Kundzewicz. This is known and recognized in the wider hydrological community too. The Journal's progress is also the result of the collective services of *HSJ* authors and reviewers and particularly of the 30 distinguished Associate Editors, orchestrated by the Editor. And this result would not have been achieved without the professionalism and commitment of Mrs Frances Watkins, Production Editor and Dr Cate Gardner, IAHS Press Manager. I am very happy that, with my new role, I will be in closer collaboration with these colleagues and the IAHS/*HSJ* community.

The doubling of the new submissions to *HSJ* explains the need for a Deputy Editor. Since 1 September 2006, I have taken the responsibility of handling several submitted manuscripts, which are now under review. Soon I will have to make decisions on approving or rejecting them. Determined by the growing rate of submissions and the very small margin for increasing the number of papers published, the *HSJ* rejection rate is high. This is the bad side of the advancement of *HSJ*; sometimes even a good paper may be rejected because there are now so many good papers. From the statistics I have seen, I understand that, on average, I will have to reject, either immediately or after iteration(s), two out of three papers. Having received many rejections for my papers, I know well the feelings of an author whose paper is declined—feelings that may get stronger as one grows older. As a token of comfort to those whose papers are rejected (which I address also to myself), I can say that sometimes rejection, despite the negative sentiments it triggers, *post factum* may prove very useful as it results in improvement and better dissemination of a paper. On other occasions a rejection may be unjustified and have no positive impact. Even this situation has to be understood because the scientific community is not perfect and its procedures are not ideal (cf. Kundzewicz & Koutsoyiannis, 2005). Such rejections should not discourage authors. Generally, we must have in mind that the outcome of the review process is not a strictly objective characterization of a paper as good or bad; sometimes very good, novel and innovative papers may be misunderstood or challenge reviewers' beliefs, thus leading reviewers to characterize the papers as poor and recommend rejection. And a paper with such an assessment and recommendation is difficult to accept (after all, the peer review system is a collective process, in which editors trust referees and *vice versa*). With these thoughts, with the apprehension of a newcomer (in my new responsibility) and with the recognition that there are a lot of uncontrollable, random parameters within the review process, I wish our authors the best of luck for their papers.

Demetris Koutsoyiannis, Deputy Editor

Kundzewicz, Z. W. & Koutsoyiannis, D. (2005) Editorial—The peer-review system: prospects and challenges. *Hydrol. Sci. J.* **50**(4), 577–591.

Isotopic effects in evaporation: revisiting the Craig-Gordon model four decades after its formulation

Continued from page 1.

Participants at the International Workshop on Isotopic Effects in Evaporation, Pisa, Italy, 3–5 May 2006.

The Craig-Gordon model, published with one of Craig's collaborators, Louis I. Gordon, has been widely applied to describe isotopic enrichment of surface water and the oceans, labelling of evaporate fluxes to the atmosphere, soil- and leaf-water exchange, ET partitioning, and isotope labelling of CO_2, among other evaporation-controlled processes. The fact that it was published in the mid-1960s and was such a monumental step forward from the prevailing "equilibrium" mindset at the time has made it one of the most widely cited articles in isotope hydrology, despite being in a non-refereed proceedings and one of the most difficult articles to get hold of until reprinted for the Pisa workshop. Although it can be problematic to accurately track citation of non-refereed contributions, particularly old ones, our research on the *Web of Science* database suggests that it has been cited at least 584 times in the refereed literature since 1977 and 231 times since 2000, but this is almost certainly an underestimate due to obscure and frequently incorrect referencing of the article. Sustained interest in the Craig-Gordon model highlights the importance of the evaporation mechanism as a primary control on isotopic labelling in the water and carbon cycles.

Few models have stood the test of time as well as the C-G model, although slightly modified over the years as fractionation factors were improved through experimental research, and with a number of common simplifications including disregard for second-order effects such as resistance to mixing in the liquid phase becoming the standard form. However, the meeting did not result in consensus for building a new and improved evaporation algorithm. The presentations at the workshop showed that the C-G model continues to be a cornerstone in isotopic studies of the hydrological cycle, and is applied on local, regional and global scales in modern and palaeoclimate studies. In addition to evaporation, isotope effects during other phase changes of water were also discussed, including vapour condensation to form liquid water and ice, and ice sublimation. The fractionations occurring during phase changes are in fact responsible for the large variability in isotope content observed in the global hydrological cycle. Processes such as evaporation and condensation, which are quantitatively reversible, are not isotopically reversible in the same way and therefore need to be carefully reconciled when isotope composition is being modelled, or when differential pathways such as evaporation and transpiration come into play.

The meeting culminated in a round-table discussion that identified some exciting new developments as well as significant opportunities for future research initiatives. The need for expanded water isotope databases and improved monitoring networks was discussed with particular emphasis placed on the need to move beyond measuring the distribution of isotopes in precipitation to other components of the hydrological cycle, most notably atmospheric water vapour. Recent programmes along these lines, including the National Ecological Observation Network (NEON, USA) and Moisture Isotopes in the Biosphere and Atmosphere (MIBA, IAEA) could serve as models for more coordinated global campaigns. The idea of a global evaporation experiment consisting of a network of evaporation pans providing time-integrated estimates of isotopic labelling of water vapour was proposed as one way of addressing the problem of characterizing atmospheric moisture isotopic compositions. Such an experiment is already underway at a monthly time-step across the Australian continent, coordinated by the Australian Nuclear Science and Technology Organization in cooperation with CSIRO and the Bureau of Meteorology as part of their GNIP programme. Extensions to the original C-G model, such as flux-weighting transfer terms to account for seasonality of evaporation, were shown to improve its applicability in highly seasonal climates and illustrate the potential for future model improvements. Better understanding of fundamental parameters controlling the isotopic labelling of evaporation, including the need for controlled experiments to refine understanding of kinetic fractionation and low-temperature equilibrium fractionation factors was also identified. The quality of the experiments conducted by Liliane Merlivat in the late 1970s is still highly regarded, providing the most accepted estimates for kinetic fractionation factors. Nevertheless, recent experiments by the UC Berkeley group and others

show that there are aspects of diffusion-controlled fractionation that are still not completely understood. One promising analytical development is that $^{17}O/^{16}O$ measurements can now be made with sufficient precision to be used as an additional tracer of water partitioning in the hydrological cycle.

The significance of having the meeting in Pisa should not be overlooked. Professor Harmon Craig (New York 1926 – La Jolla, California, 2003) started to work on his evaporation model in 1963–64 while he was on sabbatical leave at the Nuclear Geology Laboratory of the University of Pisa, created and directed by Professor Ezio Tongiorgi (Milan 1912 – Pisa 1987), the editor of the original proceedings. One of the highlights of the meeting was the 80th birthday celebration of Professor Joel Gat (Weizmann Institute for Science, Israel), whose career contributions and personal reflections on early development of isotope hydrology were captured and remembered in a slide show. His personal account of Harmon Craig's dissatisfaction for certain shortcomings of the C-G model is encouragement for us all to continue to strive for better understanding of the isotope exchange processes during evaporation.

There are upcoming opportunities to continue discussion on these issues at the planned IUGG special sessions hosted by the IAHS International Commission on Tracers in Perugia, Italy, in July 2007. These include sessions HW1001, Isotope Tracing of Water Balance, Hydrodynamics and Hydrological Processes, and JMS007, Stable Water Isotopes: from Basin to Global Scale, co-sponsored by IAMAS. The International Atomic Energy Agency (IAEA) will also be hosting its quadrennial symposium in Vienna, Austria on Advances in Isotope Hydrology and its Role in Sustainable Water Resources Management, 21–25 May 2007. IAEA is also planning to publish a collection of selected papers from the Pisa meeting in its technical documents series.

John Gibson, President ICT

Jean Birks and Tom Edwards, University of Waterloo, Canada

Roberto Gonfiantini, Institute of Geosciences and Georesources, CNR, Pisa, Italy

Craig, H. & Gordon, L. I. (1965) Deuterium and oxygen 18 variations in the ocean and the marine atmosphere. In: *Stable Isotopes in Oceanographic Studies and Paleotemperatures* (ed. E. Tongiorgi), 9–130, Laboratorio di Geologia Nucleare, Pisa, Italy.

Reports from other IAHS sponsored meetings:

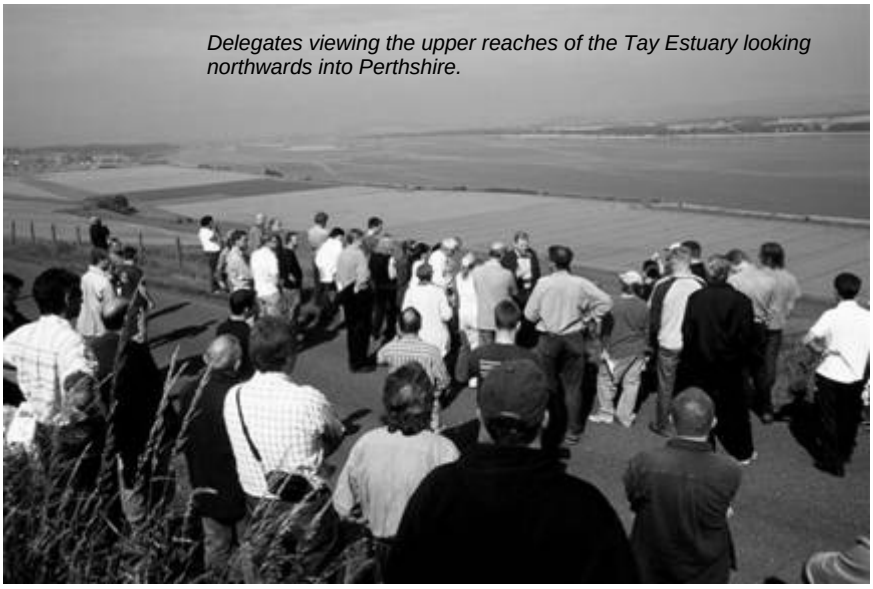
Sediment Dynamics and Hydromorphology of Fluvial Systems

International Commission on Continental Erosion at Dundee, Scotland, 3–7 July 2006

Participants really enjoyed themselves at this conference, both intellectually and socially. Indeed, eminent professors such as Des Walling commented on how this was the best conference they'd attended in 35 years. From my perspective, as a relative newcomer to this specific fluvial geomorphology community, I found the conference environment incredibly welcoming and interactive. So "hats off" to the conference organizers for running such an efficient, effective and fun week.

There are a few key reasons why I think the conference was such a tremendous success. One, the organizers demanded respect – they kept to a tightly scheduled programme and all authors were within time, with scope for questions. Poster sessions were also well planned with enough time for participants to speak with the authors. Two, the structure fostered a steady flow of engaging discussions, rigorous questions and salient comments throughout the week. I think this was due to a good mixture of well-subscribed, fun social activities and a field trip interspersed amongst the papers. Three, interaction and questions were encouraged, leading to engaging debates both in and outside formal sessions. Lastly, the small size and interactive nature of the conference (in sessions as well as at the bar) made for a stimulating week.

Scientifically, the range and calibre of the papers presented was excellent. They were presented by scientists from six continents, and ranged from detailed local-scale studies quantifying sediment fluxes (e.g. Gell *et al*.) to examining the impacts of high magnitude events (e.g. Hall & Cratchley; Horowitz). Applied and methodological as well as theoretical questions were also addressed, e.g. Rowan, Naylor, Brazier, Droppo and co-authors outlined methods for complying with policy levers such as the EC Water Framework Directive. Several papers presented new methods or new approaches/applications of existing



Delegates viewing the upper reaches of the Tay Estuary looking northwards into Perthshire.

The symposium banquet following a tour of the Research Vessel RRS Discovery, in Dundee. Delegates (from left) Alan Werritty (UK), Kazimierz Banasik (Poland), Mike Demissie (USA) and Art Horowitz (USA), accompanied by Ela Macjon-Banasik, Lyn Horowitz, Irene Werritty and Gloria Demissie.

Stanimir Kostadinov (Serbia), Mel Neave (Australia) and John Rowan (UK) enjoying sunshine on the Allt Dubaig.

methods for measuring or estimating sediments (e.g. Magillian *et al*., Xinbao *et al*., Kostadinov *et al*.). Meanwhile, Southwell and Thoms used recent research to pose questions about whether dryland rivers actually have textural gradients or whether they have shifting mosaics of patches. The IAHS awards at the end – not sure if they were created by the local organizers or whether they are a standard IAHS procedure – were brilliant and will keep the science and people fresh in our minds for a while. Martin Thoms, narrowly beat Des Walling for being named on the largest number of papers, while Roger Wotton had fascinated and repulsed the audience with the science of faecal pellets – which may necessitate changes in how sediment strength is modelled.

Larissa Naylor, Environment Agency and University of Oxford, UK

The conference proceedings volume: ***Sediment Dynamics and the Hydromorphology of Fluvial Systems****, was edited by John S. Rowan, Robert W. Duck & Alan Werritty*

IAHS Publ. 306 (*July 2006*) ISBN 1-90150268-6 630 + 10 pp.
Full price £96.00, IAHS members' price £72.00, available from IAHS Press

HydroEco´2006

Hydrology and Ecology: The Groundwater–Ecology Connection

International Commission on Groundwater, and others, at Karlovy Vary, Czech Republic, 11–14 September 2006

Many ecological systems owe their existence to groundwater and its temperature and chemistry, and can be damaged if groundwater flow or its properties are changed by anthropogenic or natural processes. The ecological systems may be the terrestrial ecological systems we see every day, the sea-floor ecological systems upon which the health of the oceans depend, or the subsurface ecological systems that maintain the groundwater that sustains so many people. To address the resulting issues, this conference was held to bring together scientists from groundwater and ecological disciplines. The themes included, but were not limited to, hydrology, ecology, ecotechnology, biology, chemistry, geochemistry, environmental biogeochemistry, and subsurface microbiology. The unifying theme was the importance of groundwater and(or) groundwater/surface water and hyporheic zone interaction to the ecological systems and processes of concern.

The conference provided an international forum (1) for interactions between groundwater and ecology to be better understood, measured, simulated, and managed, and (2) to improve the technological basis for policy decisions for issues such as reconstruction of ecologically valuable environments and the use of water resources in these environments.

The 4-day conference was attended by 145 participants from 33 countries. The programme and other information about the conference are available at:

http://web.natur.cuni.cz/hydroeco2006/

The conference was jointly convened by:

– Faculty of Science, Charles University, Prague, Czech Republic
– IAHS International Commission on Groundwater,
– T. G. Masaryk Water Research Institute (VÚV), Prague, Czech Republic
– US Geological Survey (USGS)

and sponsored and co-organized by UNESCO / IHP VI. The conference was a contribution to the implementation of the Groundwater Component of the IHP VI 2002–2007 Programme: Water Interaction Systems at Risks and social Challenges. Dr András Szöllösi-Nagy, UNESCO, was a member of the Conference Organizing Committee.

Report prepared by the organizing committee: Karel Kovar, Zbynek Hrkal and Mary Hill

Integrated Water Resources Management

International Commission on Water Resources Systems at Bochum, Germany 26–28 September 2006

The *Third International Symposium on Integrated Water Resources Management* drew 276 participants from all over the world to the Ruhr-University in Bochum, Germany. The symposium's goal was to further develop the concept of Integrated Water Resources Management. In particular, it addressed the manifold dependence of societies on water and the interrelated risks for social, economic and ecological development. With the overarching theme of *Reducing the Vulnerability of Societies Against Water Related Risks at the Basin Scale*, a broad range of questions related to co-actions between hydrological and water resources conditions and social, economic and ecological usage of, and requirements for, water resources was discussed.

This IAHS-ICWRS symposium was hosted by the Ruhr-University Bochum, Germany (Institute of Hydrology, Water Resources Management and Environmental Engineering), in cooperation with UNESCO-IHE Delft, The Netherlands and the United Nations University Bonn, Germany (Institute for Environment and Human Security). It was supported by the German IHP/HWRP National Committee, the German Federal Ministry of Education and Research (BMBF), the German Research Foundation (DFG), UNESCO-IHP and the German National Committee on Large Dams (DTK).

The symposium was structured around four topics:

- Topic 1: From Headwaters to the Mouth – Vulnerable Interactions between Landscapes, Water and Societies
- Topic 2: Flood Risk – Flood Vulnerability – Flood Protection (a Contribution to the International Flood Initiative)
- Topic 3: Water Management as a Problem
- Topic 4: Water Management as a Solution

while the oral presentations were divided into 13 sub-topics:

1 River basin interdependencies,
2 Scales of vulnerability against flooding;
3 Flood risk management at different scales;
4 Decision support tools;
5 Tools to estimate and reduce flood risk;
6 Hydro-ecological aspects in water management;
7 Hydraulic structures mitigating flood risks;
8 Chemical loads in water: N, P and pesticides;
9 Erosion, sedimentation and reservoirs;
10 Institutions in river basin management;
11 Impact assessment;
12 Regional water management; and
13 Global and climatic changes.

The aim of this symposium was to present new solutions for hydrological and water resources management related questions, to identify deficits in science and to point out necessary research in those areas. The keynotes, given by renowned invited speakers, were highlights of the symposium: H. Bode (Ruhr River Association, Germany) *Integrated River Basin Management in the Ruhr-River Area*, A. Palmieri (World Bank, USA) – *Civil Societies' Contribution to the Decision Making on Dams*, A. Schumann (Ruhr-University Bochum, Germany) – *Is Hydrology Reducing Vulnerabilities?*, S. Simonovic (University of Western Ontario, Canada) – *Flood Management: Integration of Objective and Subjective Risk*, A. Szöllösi-Nagy (UNESCO-IHP, France) – *Risk in Hydrology: SOS?* and E. Todini (University of Bologna, Italy) – *From Traditional to Sustainable Water Management: New Approaches and Tools.*

In a two-stage review process, 62 outstanding contributions were selected as oral presentations from the more than 670 contributions that were submitted. These, together with extensive poster sessions with 110 contributions formed the scientific programme of the symposium.

The presentations and discussions clearly showed that it is feasible to choose various approaches to investigate the dependence of social and economic development on water resources and to consider this dependence in water resources planning. Among those approaches were investigations on the spatial and temporal distribution of water quantity and water quality, the development of modern computer-based methods for analysis and prognosis of the status of water resources, process studies to determine the dependence of water quantity and water quality on the meteorological boundary conditions, on the physical and chemical characteristics of catchment areas and anthropogenic influences, but also planning to improve the technical and institutional basis of water resources management. Through timely communication between the conference organizers and the speakers, and the provision of stand-by presentations, it was feasible to offer a scientific programme effectively without gaps due to cancellations.

Andras Schumann with A. Szöllösi-Nagy

In a special session, chaired by Arthur Askew, President of IAHS, representatives of international water initiatives provided an overview on current activities of their respective water initiative. This special session sparked strong interest and a lively discussion on current knowledge deficits and essential future research activities for solving water management related problems evolved among representatives and participants. The following well-known water initiatives participated in this special session: UN International Strategy for Disaster Reduction (ISDR), WMO Associated Programme on Flood Management (APFM), UNESCO International Hydrological Programme (IHP), United Nations University (UNU), Global Water Partnership (GWP), World Water Council (WWC) und International Centre for Water Hazard and Risk Management (ICHARM).

The symposium ended with an interesting technical excursion to the Westhofen pumping station, a boat trip to the Bigge dam with a presentation that provided information on the history and operation of the dam, and a visit to Altena Castle.

Papers selected from the oral presentations will be published in 2007 in an issue of the IAHS Red Book Series.

Hydrological Sciences for Managing Water Resources in the Asian Developing World

Guangzhou, China, 8–10 June 2006

The Department of Water Resources and Environment of Zhongshan University, the Department of Geography and Resource Management of The Chinese University of Hong Kong, and the Key Laboratory of Water Cycle and Related Land Surface Processes of the Chinese Academy of Sciences jointly organized this conference. IAHS and IWRA were the two main sponsors of the event.

Asia is the most heavily populated continent in the world; over one-third of global inhabitants live in China and India. Although the region is characterized by enormous diversities in culture and language, almost all Asian countries face similar difficulties and challenges for socio-economic development. The majority of them are developing countries and under tremendous pressure of ever-increasing populations. Moreover, in their path to modernity and prosperity, these countries are, inevitably, experiencing massive urbanization and industrialization. Therefore, no matter what natural conditions exist, population pressure and societal transformations have brought numerous resource and environmental problems to Asian countries, among which water is one of the biggest. The Asian Monsoon climate makes the water problems even more complicated and challenging. Finding solutions for managing water resources plays a vital role in putting Asia's development on a sustainable track.

With the above background, the conference aimed to offer a multi-disciplinary platform for water experts and professionals, within and outside of the region, to exchange their views and research findings on a wide range of water problems in Asia. The Organizing Committee received over 600 abstracts and selected 317 for oral and poster presentation, covering most aspects of the science and practice of hydrology and water resources management. There were five specific themes: (1) Hydrological science and engineering for solving water problems, (2) Development and application of new technologies in hydrological practices, (3) Modelling techniques in water resources planning and management, (4) Management of water environment, and (5) Sustainable water resources management. About 300 participants from 32 countries attended the three-day conference.

After a quarter century of economic reform and development, China is becoming a growth engine of the world economy and an emerging power, which increasingly attracts international attention. Although the Chinese economy has maintained long-term and stable growth (close to 10% every year) for over two decades, it has faced many difficulties and challenges in resource management and environmental protection. In China water is such a critical factor and sometimes a limiting constraint for socio-economic development because of the highly variable distributions of water resources, both temporally and spatially driven by the monsoon climate, but also because of the ever increasing demand and consumption of water as a result of population expansion and economic growth. The government officers of water agencies and Chinese experts in their keynote presentations addressed problems and experiences in water resources management, as well as hydrological research issues and achievements in China. Siyi Hu, Vice Minister of Water Resources, spoke briefly on water resources development and management from a national perspective. Water officers of Guangdong Province explained the hydrological characteristics and water problems of the region. Changming Liu and Jiyang Wang, academicians of the Chinese Academy of Sciences, discussed the South-to-North Water Transfer project and groundwater issues in China, respectively. Other renowned hydrologists from China, including Jun Xia, Hao Wang, Shenglian Guo, and Renduo Zhang, delivered keynote presentations on modelling and experimental studies of watershed hydrology and water resources systems in several major river basins in China. The other half of the keynote speakers were from overseas and presented on a wide range of topics, including international hydrology (Arthur Askew), multidisciplinary water management (Ben Dziegielewski), flood risks in Asia (Zbigniew W. Kundzewicz), the copula method in water engineering (Vijay P. Singh), the Global Water System Project, GWSP (Charles Vörösmarty), and distributive simulation and multistage optimization for watershed management (Gordon Huang). All of the opening speeches and keynote presentations were interesting, informative and stimulating.

Oral presentations by conference participants in concurrent sessions went well and generated active exchange of information and discussion. The speakers included not only established scientists and professionals, but also

many young graduate students who are working on their academic degrees to prepare for a water-related career. The conference served as a golden opportunity for these "new blood" of the hydrological profession to meet and interact with many international experts. It is notable that a substantial number of academics and researchers who were originally from Mainland China and now work in universities and research institutes in North America, Europe, and Australia played a very active role in the conference. Many have some sort of connection and collaboration with Chinese institutions and they tend to study water problems in China using western methods and technology. Their presentations were well received and served as a catalyst for further collaboration with their counterparts in China.

The conference was concluded by an open-floor discussion in which many participants seized the opportunity to speak. Some offered their commendable comments on the conference and others voiced their opinions on the needs and directions of hydrological research and practice, especially in the Asian developing countries. Many recognized the gap between research (often data intensive modelling studies) and practice for decision-making in water management. It was urged that a mindset of always putting theories and models into real-world applications must be firmly built up among both research and practicing hydrologists. Otherwise, scientifically and technically sound decisions could not be made and hydrological research would be meaningless. Another major consensus was that communication and collaboration among hydrologists and water professionals in the Asian developing countries should be further strengthened and that similar conferences under the sponsorship of IWRA and IAHS would be able to serve this purpose.

Lastly, we would like to highlight the uniqueness and significance of the conference location. This international conference on hydrological sciences and water resources management was the first of its kind ever held in South China. Severe water shortages in the Northern China Plain and inland territories, as well as the flood hazards in the Yangtze River basin have been the dominant water problems in China. This is why China has placed its emphasis of hydrological research on the northern, northwestern and central parts of the country over the years. One may have noticed that the majority of water-related academic and professional activities have taken place in northern (Beijing) and central (Wuhan and Nanjing) China. However, the Pearl River (Zhujiang) Delta in South China, represented by the "Golden Triangle" of Guangzhou-Hong Kong-Macau, has been the fastest developing region in the country over the past 25 years. As a result of rapid urbanization and industrialization, this region has witnessed enormous environmental changes as it has been transformed from a predominantly rural area into the so-called "World Factory" because of its massive export-oriented manufacturing. The rapidly changing environment of the delta region exhibits a variety of typical water problems also faced by many other urbanized areas in Asia. Moreover, the Pearl River Delta also uniquely has one of the most complex deltaic drainage networks in the world, as well as a dense agglomeration of over 100 towns and cities.

Therefore, conducting this successful conference in Guangzhou has provided participants with an excellent opportunity to learn about various emerging water problems in this highly dynamic region.

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The European Drought Centre

The European Drought Centre (EDC) is a virtual centre which aims to coordinate drought related activities in Europe and promote collaboration and capacity building between scientists and the user community. It was established in 2004 as an outcome of the EU supported ASTHyDA project and has since then developed its ideas in close cooperation with the Northern European FRIEND Low Flow Group (UNESCO-IHP). The long-term objective of the centre is to enhance European cooperation in order to mitigate and adapt the impacts of droughts on society, economy and the environment. Although the EDC primarily has a European dimension, it will also link with international projects, organizations and experts outside Europe.

EDC specifically aims to:

- Act as a platform to initiate and discuss scientific progress on drought research within the academic community, but as important, be a meeting place between multi-disciplinary experts in drought research, policy and operational management.
- Encourage joint research and support coordinated research efforts to enhance knowledge of drought, including large-scale pan-European studies.
- Develop and implement training activities.
- Work towards establishing a European Drought Watch System, focusing on drought forecasting and monitoring at the pan-European level.
- Establish best practice guidelines for drought monitoring, forecasting, prediction and mitigation to support operational drought management at the national level.
- Develop links with international programmes and national drought activities outside Europe.

Drought is a sustained and regionally extensive occurrence of below-average natural water availability which affects all components of the water cycle. It is a recurring and worldwide phenomenon, with spatial and temporal

characteristics that vary significantly from one region to another. Drought should not be confused with aridity, which is a permanent feature of a dry climate, nor with water scarcity which implies a long-term imbalance of available water resources and demands. Drought is a natural hazard that cannot be prevented, but its impacts can be reduced through mitigation and adaptation, i.e. knowledge, preparedness and good management practice. In this respect, the EDC will interact with the scientific and operational communities as well as policy makers and society to raise the awareness of the drought hazard and may represent an important platform for future European drought initiatives.

The EDC offers easy access to updated and relevant information on drought activities, information on the current drought situation in Europe, archived information on historical droughts and recent references. If you are interested in joining the EDC you will find additional information on the web: *http://www.geo.uio.no/edc*.

Lena M. Tallaksen & Henny A. J. van Lanen
Coordinators

TEACHING HYDROLOGY
Are we providing an interdisciplinary education?

Hydrology education differs from education in other fields in many aspects. Hydrology is a relatively young science and a common hydrology curriculum is therefore not yet well established. Internationally, few departments exist that offer an undergraduate degree in hydrology. Most students studying Geography, Environmental Science or Civil Engineering attend one or two courses in this subject area during their undergraduate years, and only specialize in hydrology during their graduate education. Hydrology is also a problem-driven science, which means that many components of a hydrology class are based on engineering problems (at least historically).

The problems hydrologists are asked to solve today and in the future are changing though. They increasingly go beyond the more traditional issues of flood forecasting or infiltration estimates. Problems are increasing in the space and time scales considered, and now often include water quality aspects, land-use change effects, climate change, etc. All these extensions require that hydrologists receive an interdisciplinary training with a solid knowledge and understanding of processes, theory, observation and modelling, and the ability to work in teams with other scientists (e.g. meteorologists, ecologists, climatologists, foresters, etc.). This changing focus of hydrology is demonstrated, for example, by the 10-year IAHS initiative on Predictions in Ungauged Basins (PUB, Sivapalan *et al*., 2003). The PUB problem is inherently interdisciplinary and major advancements in this area are unlikely to come from individual scientists (Wagener *et al*., 2004).

To understand how hydrologists are currently educated, we initiated an online survey whose main results we will present here (Wagener *et al*., 2006). This survey was supported by IAHS and received submissions from over 150 international hydrologists. The survey can be found at: *http://www.ideal.forestry.ubc.ca/markus/survey.asp*.

Additional information about the research and teaching group (RTG), which initiated this survey, can be found through a link on the survey web site. All data collected are freely available and any interested parties are invited to approach any of the authors to discuss the issue of hydrology education further.

The 158 survey participants were predominantly North-American (71%), while the remainder mainly work in Europe. About one-third are teaching in Engineering departments (35%) and about one-quarter teach in Earth Science departments (24%). The rest are distributed across Environmental Science, Natural Resources, Geography and other departments. Most of them obtained their highest degree from Engineering (43%) and Earth Science departments (23%). The age distribution was well-mixed between junior and senior educators and about half had taught their hydrology class more than five times. Most (54%) respondents taught relatively small classes (10–15 students) mainly at the graduate level. Classes with more than 50 students are the exception. Educators used a wide variety of sources to prepare their lectures. Material included primary and secondary textbooks, peer-reviewed articles, government reports, and large percentages of independently generated material. The 158 participants listed a total of 52 different textbooks used to prepare their classes. About 39% stated that they do not use a textbook at all to prepare their classes, but rather utilize individually collected material. No textbook was used by more than 10% of those using one. The range of sources and our finding that more than one-third of all participants are not using an accompanying textbook at all partially explains the 3–5 hours per hour lecture preparation time in initial course offerings. This preparation time dropped to 1–2 hours when the course was taught in subsequent years. Additional details can be found in Wagener *et al*. (2006).

This survey is an attempt to gain a better understanding of how hydrology is taught, by whom, with what material, and who the students are. We are currently lacking a clear picture of what a hydrologist's training should look like. This lack of consistency in education, and the difficulties of establishing the interdisciplinary training needed might slow our progress in hydrological science and needs to be improved.

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Why should hydrologists work on a large number of basin data sets?

Reproduced from the Introduction and Synthesis to the volume: *Large Sample Basin Experiments for Hydrological Model Parameterization: Results of the Model Parameter Estimation Experiment* (IAHS Publ. 307, 2006)

Because almost any model with sufficient free parameters can yield good results when applied to a short sample from a single catchment, effective testing requires that models be tried on many catchments of widely differing characteristics, and that each trial cover a period of many years (Linsley, 1982).

There is now such a wealth of publications in hydrology, that it seems unlikely that any hydrologist can find the time to read even a decent part of it. Therefore, we have prepared this rapid introduction and summary of the papers that constitute this volume (the MOPEX report). Our aim is to convince you, the reader, to read the report in order to discover the original contributions, which we believe are really worth the time you will spend on them. The volume contains 25 papers, many of which follow on from the presentations made at the last two MOPEX workshops (held in July 2004 at ENGREF, Paris, France, and in April 2005 at the IAHS Assembly in Foz do Iguaçu, Brazil). One of the objectives is to show how valuable it is to work on large data sets in hydrological modelling.

The contributions are organized into five sections:

- The first section provides an introduction to the goals of the MOPEX project, and presents the databases that were used by the participants, parts of which are made available to the hydrological community on the DVD accompanying the volume.
- The second section groups four review papers, which were solicited especially for the volume, in order to provide alternative views on the use of large sample basin experiments in hydrology.
- The third and the fourth sections present model parameterization experiments based on samples of a large number of basins: in the third, the focus is on the databases that were gathered specifically for the MOPEX programme, while the fourth presents regionalization and parameterization studies based on other large hydrometeorological databases.
- The final section compiles the most recent results of the project, and discusses its perspectives.

But let us now examine the justifications for the type of research presented. After all, why is it so important to consider the results of experiments considering a large number of basin data sets, while the trend of the last decade has been towards more and more extremely detailed studies of a single basin or even a single hillslope?

Why we believe that hydrological modelling research should focus on a large number of basin data sets

In the early days of hydrological modelling, computation power was a limiting factor and hydrologists could generally only afford to work on a few flood events on a single basin. Forty years later, this problem of computation power has almost become a detail. However, the work on a single basin or a limited number of basins still remains the rule in most hydrological modelling sudies. Instead, we believe that hydrologists can and should take advantage of working on large sets of basins. We detail here a few reasons why this should allow some progress in hydrological research.

Reason 1*: Model intercomparisons can definitely be useful … provided they are based on large data sets*

An approach proposed over the last three decades to improve basin models is model intercomparison. The successive international intercomparisons organized by WMO since the end of the 1960s (Askew, 1989; WMO, 1975, 1986, 1992) have been very efficient in promoting a sound competitive spirit among research teams and in forcing modellers to question some of their preconceptions. The same applies for intercomparisons organized by single groups (Vandewiele *et al.*, 1992; Perrin *et al.*, 2001).

Some authors have been rather critical of intercomparisons and their capability to identify guidelines for model selection (Wheater *et al.*, 1993; Woolhiser, 1996). Our opinion is that, as long as the number of basins included in the comparison is limited (as was the case in most of the comparisons published up to now), their conclusions may well be a matter of luck, and so the intercomparison exercise loses most of its interest. What is needed is a statistically significant number of basins (such as in some of the work presented in the volume), to get a robust model assessment, even if it must be acknowledged that such comparisons are still the exception rather than the rule. However, an increasing number of studies based on large data sets have been published recently (Perrin *et al.*, 2001; Merz & Blöschl, 2004; Oudin, 2004; Mouelhi *et al.*, 2006), and this volume will add more: e.g. a paper by Folton & Lavabre based on 880 basins, and one by Rojas Serna *et al.* based on a sample of 1111 basins, are current records (however, that may not last very long).

When based on several hundreds of basins, intercomparisons can be extremely instructive and they can definitely help to improve models and assess their generality (Perrin *et al.*, 2003). However, these intercomparisons can only be implemented when models can be set up (i.e. structured, parameterized) in a reasonably automated way. Thus, this does not apply to most of the so-called "physically-based" models, since running such models on just one basin usually requires several months of work.

Reason 2*: Only large data sets allow us to move from climate/region-specific towards general catchment models*

Some modellers insist on the fact that catchment models should be climate- or region-specific. This is in line with

the prescriptions of the "conceptual" school, which advocate keeping in a catchment model only those "driving processes" that the modeller believes to be important in a given basin. As the "driving processes" may vary depending on hydro-climatic zones, it then seems natural to recommend a climate-specific modelling structure.

However, some of the founding fathers of hydrological modelling recommended looking for models with a certain ambition of generality. Ray Linsley (1982), while alluding to the great variety of driving processes which may affect the rainfall–runoff relationship, wrote that "*these differences do not mean that a single model cannot be applied in all cases. The model must represent the various processes with sufficient fidelity so that irrelevant processes can be 'shut off' or will simply not function*". And Linsley concluded that "*it is no longer necessary for each hydrologist to develop his or her own model for each basin, since […] a new model for every application eliminates the opportunity for learning that comes with repeated applications of the same model*". The MOPEX approach is in line with such a statement.

***Reason 3**: The application of models on ungauged basins requires parameter estimation methods or laws that must be elaborated and/or calibrated on a wide range of conditions*

Ungauged basins pose a formidable challenge to hydrology, as the methods proposed to estimate their parameters are still extremely uncertain. If we are to move forward on this topic during the PUB decade, existing and future methods should be tested and validated over many basins, representative of a range of climates. This is because any unknown function f can, on a set of basins with similar climate conditions, be reduced to a linear first-order series expansion $y = f(x_0) + (x - x_0)f'(x_0)$. Conversely, if a test set encompasses semi-arid as well as humid basins, x will vary over a wide range of values and the proper structure of function f will be tested effectively.

What are the main conclusions?

The volume is the result of enthusiastic (but sometimes contradictory) exchanges held within a diverse group of modellers. This means that not all of the papers necessarily agree with each other. However, they all look with confidence towards data sets which have a large number of basins and to intercomparison studies to guide their future work on model parameterization and regionalization. Let us here try to synthesize the main lessons of each section:

1. *Data sets of a large number of basins are becoming widely available*

We believe that the data set on the DVD that comes with this volume provides a wonderful opportunity for hydrologists worldwide to test their own methods and models. We hope in the future to be able to extend this data set and make it available through ftp.

2. *Methods for regionalizing catchment models are still in their infancy*

A lot remains to be done for both simple lumped models and complex distributed ones. The explanation of the model parameter values representative of basin behaviour by basin characteristics remains unsolved. As long as this cannot be determined, it is unlikely we can hope for any progress in model regionalization.

3. *Parallel work on the same data set of a large number of basins is extremely instructive*

For the individual hydrologist, it is always instructive to read about the experience of his colleagues published in the scientific literature, but working on the same data set is a wonderful opportunity to better understand what others actually do, what assumptions they really make, and what approach or model structure is actually superior to another.

4. *Alternative approaches are emerging that may change the way we look at model regionalization*

Although they have to repeatedly face the failure of their past efforts to deal with ungauged basins, hydrologists are not at a loss. Innovative approaches are proposed and tested, either to make the ungauged basins less ungauged, or to make progress with the methods of model parameterization.

5. *Large samples of basins, as promoted by MOPEX, have much to contribute towards the success of the PUB decade*

There is no consensus yet on the fact that experiments based on data sets of a large number of basins are needed in hydrology, and this volume should be seen as a very partial effort to promote the idea of using large data sets for hydrological studies (science does not necessarily need consensus to move forward!) It is often argued that, as the basin sample increases in size, it becomes impossible to perform a detailed validation of the raw input data time series, and this will make the data set unusable. But in a comparative setting, there is no reason why a model would be less sensitive to bad input data than another: poor quality data will undoubtedly equally disadvantage all models. Thus, we believe that it is fallacious to object to the use of a large number of basin data sets on the grounds of the difficulty to control quality. For us, one thing is sure: a large sample of basin data sets and well organized intercomparisons may not be sufficient to ensure progress in hydrology, but at least, they are a necessary condition.

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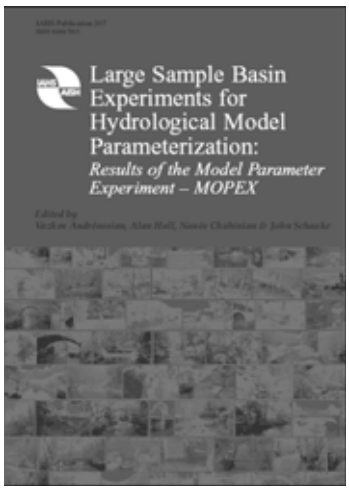

Large Sample Basin Experiments for Hydrological Model Parameterization: Results of the Model Parameter Estimation Experiment (edited by *Vazken Andréassian, Alan Hall, Nanée Chahinian & John Schaake*

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HISTORICAL HYDROLOGY

A précis of the editorial to a Special Issue of Hydrological Sciences Journal (HSJ 51(5)) on Historical Hydrology edited by Rudolf Brázdil and published in October this year. The full editorial (by Rudolf Brázdil & Zbigniew W. Kundzewicz) and the abstracts to the 14 papers are free to view online: simply click HSJ online at the IAHS web site and go to issue 51(5).
An HSJ subscription is required to access the full papers online, or you can pay to view.
Print copies of the Special Issue can be purchased from IAHS Press.

River gauges provide essential information, but the length of record is often limiting. Instrumental records can only be extended into the future, when new data are obtained, but not back into the past. Hence, the possibility of extending river records by acquiring information on pre-instrumental events is very welcome. This underpins the importance of historical hydrology and palaeohydrology: providing knowledge of hydrological events outside of the instrumental records. Historical hydrological information is typically limited in location (near to human settlements), and not all large events may be mentioned in historical information – their inclusion depends on human perception at the time; events that led to high disruption and damage are quite likely to be remembered. Palaeo-information, encapsulated in geophysical archives, is also available for uninhabited areas.

The increased frequency, severity and damage of disastrous floods experienced in recent decades in many parts of the world, leads to intriguing scientific and practical questions. Is this increase related to better information possibilities? Is the main driving factor human encroachment into flood-prone areas? Is there any global warming trend in flood records? Are the recent violent floods really higher than extreme events from the past, pre-instrumental era? What is the role of land-use changes in watersheds and anthropogenic changes in the water courses (e.g. river regulation)? Are there any changes in the generating mechanisms of floods?

Answering such questions needs systematic research which cannot be based just on data from the relatively short period of hydrological measurements starting in the 19th–20th centuries. Significant extension of information about floods from the pre-instrumental period is offered by historical hydrology and palaeohydrology. Although palaeo-hydrology or palaeoflood hydrology (e.g. Baker *et al*., 2002; Benito, 2003) is already recognized as an important part of hydrology, historical hydrology, dealing mainly with documentary evidence about hydrological events, has not been broadly recognized yet, but offers considerable potential. Some progress has been achieved recently in Europe partly as a by-product of the research on weather extremes in historical climatology (Brázdil *et al*., 2005).

Historical hydrology was selected as the theme of this Special Issue of *Hydrological Sciences Journal* with the aim of defining the research field and demonstrating its potential in studying hydrological extremes in Europe. It is opening a new interdisciplinary research area linking hydrology and history, which may prove beneficial for further research in both disciplines, overcoming the barriers between the natural and social sciences and inducing a cross-fertilization effect.

The Special Issue starts with an overview characterizing the state of the art of historical hydrology in Europe with respect to flood risk studies. Different types of documentary data, historical perception of floods and recent achievements in such areas as: reconstruction of past changes in watersheds and river channels, analysis of long-term frequency patterns of historical floods, estimation of flood discharges associated with historical floods, deciphering meteorological causes of historical floods,

synthesis of palaeofloods, historical and instrumental floods, impacts of historical floods and the climate–flood links, are discussed.

The subsequent papers contribute to the basic aim of historical hydrology: "reconstructing temporal and spatial patterns of runoff conditions as well as extreme hydrological events (floods, ice phenomena, hydrological droughts) for the period prior to the creation of national hydrological networks" (Brázdil *et al*., 2006). The papers can be divided into three groups. The first present long-term flood series derived from documentary evidence and discuss flood frequency, e.g. Mudelsee *et al*. (2006) have assembled a series of floods for the River Werra in Germany for the period 1500–2003.

The second group is devoted to analysis of individual disastrous events, e.g. documentation of expenses for repairs of the bridge across the Traun River (a tributary of the Danube) in the town of Wels (Austria), was used by Rohr (2006). Records kept in the book of accounts, written by the bridge master and available in the city archive, allowed Rohr to reconstruct flood information for the period 1441–1574, with a classification of flood intensity based on the corresponding damage.

Further papers deal with storm surges, statistical analysis of long-term flood series, atmospheric circulation causes of floods and hydrological droughts, e.g. Pfister *et al*. (2006) have investigated hydrological winter droughts within the Upper Rhine basin using water-stage measurements (since 1808 at Basel, Switzerland) and documentary evidence. They consider 30 severe winter droughts since 1540 occurring after periods of low precipitation, mainly due to persistent anticyclones centred over Western Europe. During the 20th century, severe winter droughts were relatively rare, compared to earlier. This can be related to an increase in winter temperature and precipitation.

The editors hope that this *HSJ* Special Issue on Historical Hydrology will serve as stimulation for further research activities in this area. The volume contains much useful material of interest to a multi-disciplinary readership, including experts interested in climate, water, environmental history, natural disaster protection, and possibly also the media.

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Workshop: Glaciers in Watershed and Global Hydrology

Obergurgl, Austria, 27–31 August 2007

Sponsored by
International Commission on Snow and Ice Hydrology (ICSIH)
IUGG Commission for the Cryospheric Sciences (CCS)

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SCOPE Glaciers significantly modify streamflow both in quantity and timing, even with low percentages of catchment ice cover. This workshop aims to bridge the gap between glaciologists and hydrologists and will focus on:

(1) modelling of glaciers in runoff models (How can glaciers be represented in runoff models? Which type of glacier melt and routing routines are necessary to capture the specific characteristics of glacial discharge? How can glaciers be included in global hydrological models?)
(2) effects of climate change on glacier runoff and the hydrology of glacierized catchments (How will annual, seasonal and diurnal runoff characteristics change as glaciers continue to retreat? How does the response vary in different climate regions?)
(3) information content of glaciers for hydrological modelling (What kind of information can be extracted from glaciers that can aid modelling? How can glacier measurements help to constrain model parameters or provide model input?)

The workshop will address all spatial scales from small-scale catchment modelling to regional and global hydrological modelling. Contributions on any of the above topics are solicited.

ORGANIZATION The workshop will be held over 3 days, including a ½ day excursion. Additionally, a 1–2 day excursion to Vernagtferner and the nearby research/gauging station will be offered. Publication of selected contributions in an international journal is envisaged. **There is NO registration fee. The abstract deadline is March 2007.**

Calendar of Meetings Organized/Sponsored by IAHS

Details of these plus many non-IAHS meetings are provided at the IAHS web site: click on meetings

2006	Conference	Contact details
St Moritz, Switzerland 7–10 December	7th International Workshop on *Precipitation in Urban Areas : Extreme Precipitation, Multisource Data Measurement and Uncertainty*	Dr Peter Molnar, Institute of Environmental Engineering, ETH Zurich, Switzerland tel: +41 1 6332958; fax: +41 1 6331061; molnar@ifu.baug.ethz.ch
2007		
Perugia, Italy 2–13 July	XXIVth IUGG General Assembly IAHS Scientific programme, 9–13 July 2007	Prof. Lucio Ubertini lucio.ubertini@uniroma1.it http://www.iugg2007perugia.it/
Obergurgl, Austria 27–31 August	ICSIH/CCS Workshop on *Glaciers in Watershed and Global Hydrology*	Regine Hock, regine.hock@natgeo.su.se http://www.ees.su.se/obergurgl2007
Helsinki, Finland 3–6 September	*Third International Conference on Climate and Water*	
Copenhagen, Denmark 9–13 September	ModelCARE 2007 – *Credibility of Modelling*	Jens Christian Refsgaard, Geological Survey of Denmark and Greenland (GEUS) tel: +45 3814 2776; jcr@geus.dk or Heidi Christiansen Barlebo, tel: +45 3814 2775; hcb@geus.dk http://www.polytec.dk/modelcare2007
Entebbe, Uganda October	*Groundwater & Climate in Africa*	Richard Taylor, Department of Geography, University College London, UK tel: +44 207 679 0591; fax: +44 207 679 4293; r.taylor@geog.ucl.ac.uk
Manaus, Brazil Fall	IAHS-WMO Conference *Advances in Hydrometry*	Pierre Hubert, IAHS Secretary General; iahs@ensmp.fr
Fremantle, Western Australia 25–29 October	GQ 2007: *Securing Groundwater Quality in Urban and Industrial Environments*	Wendy Whitford, tel: +61 8 9333 6273; wendy.whitford@csiro.au Greg Davis, tel: +61 8 9333 6386; greg.davis@csiro.au
New Delhi, India 18–21 December	*Water, Environment, Energy and Society* (WEES-07)	K. D. Sharma, Director, National Institute of Hydrology, Roorkee, India sharmakd@nih.ernet.in

Calibration and Reliability in Groundwater Modelling: *Credibility of Modelling*

Copenhagen, Denmark, 9–13 September 2007

ModelCARE 2007

ModelCARE 2007, the sixth international conference on Calibration and Reliability in Groundwater Modelling, aims at providing an international forum for state-of-the art presentations on relevant methodologies and techniques, and the identification of the needs for future development. The conference will also attempt to illustrate the applicability of various techniques through advanced case studies on calibration and reliability assessment.

The principal topics addressed in the conference will include:

- Credibility of modelling perceived by water managers and stakeholders in water resources management.
- Geological modelling and conceptual model uncertainty.
- Integrated hydrological modelling (coupled descriptions of saturated, unsaturated, surface water).
- Modelling of reactive and density affected transport.
- Value of data at different spatial and temporal scales for model uncertainty reduction.
- Use of new data types from geophysical and remote sensing techniques.
- Developments in modelling and uncertainty assessment.
- Parameter estimation and model calibration.
- Groundwater modelling in relation to the Water Framework Directive and the Groundwater Directive.

The organizers welcome submissions on relevant topics for oral or poster presentation.

Conference web site: http://www.polytec.dk/modelcare2007/ **Abstracts are due by 1 February 2007**

Conference Secretariat ModelCARE 2007
c/o MIACON Meeting and Conference Services,
Grevegaarden, Assensvej 324, DK-5642 Millinge, Denmark
tel.: +45 4585 9727; fax: +45 4583 9727;
Email: mia@miacon.dk; www.miacon.dk

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Short Course: Stochastic Processes and Time Series Analysis

Viterbo, Italy, 5–9 February 2007 http://www.unitus.it/agraria/interna.asp?idpag=2895
Registration deadline: 22 December 2006. Registration fee: €250 for PhD students, €500 for others

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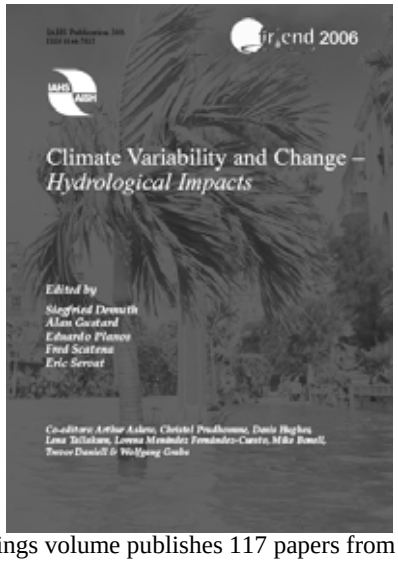
fr,end 2006

Climate Variability and Change – Hydrological Impacts

Edited by Siegfried Demuth, Alan Gustard, Eduardo Planos, Fred Scatena & Eric Servat



Since 1985, the international FRIEND (Flow Regimes from International Experimental and Network Data) research programme of UNESCO has developed to become a global network of researchers from universities, research organizations, operational hydrological agencies and policy makers, for exchanging and sharing scientific knowledge and data. Eight regional FRIEND groups have been established and are investigating global change impacts on the hydrological cycle, statistical analyses of hydrological extremes, flow forecasting, hydrological modelling at different scales, variability of hydrological regimes, uncertainties in applying hydrological and water resources models and region-wide surface water assessment, and to enhance capacity building in developing countries.

The Fifth International FRIEND conference was held in Havana, Cuba, and this proceedings volume publishes 117 papers from over 30 countries, in English, French and Spanish. It reflects both the international dimension of FRIEND and the key challenges facing hydrologists in the 21st century. The papers focus on: Data: *databases; networks; GIS*; Hydrological extremes: *low flow prediction and forecasting, flood prediction and forecasting, rainfall–runoff modelling*; Hydro-climatology: *precipitation variability and prediction, teleconnections, climate change and impacts, trends*; and Ecosystems: *in-stream ecology, flood plains, water quality, sediments, groundwater, water balance, soils and land cover.*

IAHS Publ. 308 (*November 2006*) ISBN 978-1-90150278-7 708 + xii pp. Full price £115.00 IAHS members' price £86.25
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