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IAHS Newsletter

NL96 March 2010

World Water Day

The international observance of World Water Day is an initiative that grew out of the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. UN-Water has chosen *Clean Water for a Healthy World* as the theme for World Water Day, on 22 March 2010.

Choking of the Tawil Lift Irrigation canal with plastic bags and cartons, and vegetable and fruit waste

Plastic bags exacerbate water quality problems in India *see page 4*

The Water Resources of South Africa

A six-year study commissioned by the Water Research Commission of South Africa and referred to as WR2005 was completed at the end of 2009. There have been three previous comprehensive water resources appraisals of South Africa, starting in the 1960s, which have been invaluable tools for water resources practitioners in the region. The late Professor Des Midgley, recipient of the 1996 International Hydrology Prize, was a key participant in the previous studies. The WR2005 study focused on an integrated water resource analysis of South Africa, Lesotho and Swaziland. While the previous appraisals only looked at surface water resources, the WR2005 appraisal has integrated the groundwater/surface water interface, water quality, streamflow reductions (such as caused by afforestation and alien vegetation) together with the latest GIS and computing tools available. *Continues on page 9*

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Further reports from the Joint IAHS–IAH Convention in Hyderabad

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HYDROCOMPLEXITY: New Tools for Solving Wicked Water Problems

The programme for the 10th Kovacs Colloquium, which will take place at UNESCO in Paris, is now available. There is no charge to attend this biennial event, which always provides a great opportunity to hear and meet with leading international hydrologists.

For the first time, there will also be a poster session so that participants can present their own work. The invited papers and poster abstracts will be published in a Red Book. *See page 8*

Isotopes and Tracers in Hydrology and the 2009 Henry Darcy Lecture

The brief reports of the presentations at this meeting in The Netherlands in November 2009 provide an overview of the state of the art in isotope hydrology, and future developments. Whereas today the focus of water-related isotope research is mostly on the usage of ^{18}O, ^{2}H and ^{3}H (components of the water molecule), the current trend is towards "isotope biogeochemistry" using ^{15}N, ^{13}C and ^{34}S.

See page 11

Message from the President *from Gordon Young*

gordonyoung_wwap@yahoo.com

Our Association has been in existence for almost 90 years and, over that time, has evolved into an effective and efficient mechanism for promoting excellence in hydrological research and for disseminating knowledge and understanding through our various publications – *Hydrological Sciences Journal*, the Red Books (which primarily reflect the output from our symposia) and our special publications such as the Benchmark and Blue Book series.

IAHS has never been a stagnant organization – its structure has evolved with new Commissions and Working Groups being introduced from time to time, to reflect new emphases in the science. While our mode of organizing and conducting our symposia has, overall, been effective, we should always be asking whether improvements can be made to make those events even more productive.

Such questioning of the way we conduct our symposia was undertaken by the IAHS Bureau during the IAHS Assembly in Hyderabad in September 2009. Focus was particularly directed to consideration of how to better include poster papers, both within the meetings and within the proceedings from the meetings, and how better to include young scientists in the symposia.

1. *The inclusion of poster papers within Symposia*

There was a general consensus that poster papers presented at many of our symposia have not been receiving the prominence and attention that they merit. As a result of the deliberations of the Bureau there was agreement that all accepted papers, whether presented orally or as posters, should receive equal recognition and that they should all be printed as full papers within the resultant Red Books. Adoption of this procedure should give all participants a better chance to receive funding for conference attendance.

Thus, the suggested policy for future Red Books published as output from IAHS symposia is that orally presented papers and poster papers should be regarded as equal in merit and thus all should be published as full papers.

This will have consequences both for the process of soliciting papers for symposia and for the size of resultant Red Books:

- Convenors would initially decide on a tentative duration for the symposium (1, 2 or 3 days), bearing in mind the likely extent of participation.
- A maximum length would be set for each paper – normally 6 pages; invited papers might be allowed more pages, at the discretion of convenors.
- Papers would be solicited and tentatively accepted based on relevance and quality of abstracts.
- Full papers would be accepted by the set deadline (different for pre- and post-published Red Books) confirming that they will be published.
- Decisions would be made on which papers to select for oral presentation to give balance to the symposium programme.
- Authors of poster papers would be requested to prepare an oral presentation (in the case of no-shows these papers could provide back-up for the oral sessions).
- Consideration should be given to allow poster presenters to outline their poster presentations in 3–5 minutes – this would further include the posters as an integral part of the symposium.
- Time must be allotted within the symposium schedule for poster paper session(s) to further include posters as an integral part of the event.

It is suggested that this new policy be implemented firstly within IAHS and IUGG Assemblies (at the Melbourne Assembly it has already been decided that sessions for poster papers will not clash with sessions for oral presentations). It is further suggested that the policy might also be adopted by stand-alone IAHS symposia (at the discretion of the convenors). Modified guidelines might also be adopted at particular symposia (again at the discretion of the convenors), for example the inclusion of 2-page abstracts of poster papers for events such as the Kovacs Colloquium in which all substantive papers are by invitation. This policy might have to be modified for Red Books resulting from symposia convened jointly with other Associations. *Continues p. 2*

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Edited by Cate Gardner

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

Articles 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, Pierre Hubert, preferably to: *pjy.hubert@free.fr*, or to:

IAHS, UMR Sisyphe, Université Pierre & Marie Curie,
Case 105, 4 Place Jussieu, 75252 Paris Cedex 05, France

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

The next Newsletter will be published in July/August 2010; copy deadline 28 June 2010.

Erratum

Hydrology in Mountain Regions: *Observations, Processes and Dynamics*

The names of: Regine Hock, Michael Lehning, Masaki Hayashi and Robert Gurney were inadvertently omitted from the list of editors of this Red Book, IAHS Publ. 326, at the time of publication. They, with Danny Marks, were responsible for editing the contributions which are published in this book.

IAHS Publ. 326 (*2009*)
ISBN 978-1-901502-89-3 184 + viii pp. Price £45.00

Continued from p. 1

2. *The better inclusion of young scientists in the organizing and convening of Symposia*

One of the recommendations from the informal meeting of young scientists at the Hyderabad Assembly (see *www.iahs.info/newsletters/NL95.pdf*) was that at least one young scientist should be included as a convenor of each symposium and workshop. This should lead to invigoration of our events and give training to young scientists for future lead roles in the Association. Thus, lead convenors are strongly encouraged to implement this suggestion and, equally, young scientists should not be afraid to offer their possible services as convenors.

Over the next year there are several exciting events being organized by IAHS (see *www.iahs.info/conf_frm.htm*). In 2011 we will hold our next major Assembly, in Melbourne, as part of the General Assembly of the International Union of Geodesy and Geophysics (IUGG). Over the next months the suite of symposia and workshops organized by IAHS and some jointly with other Associations of the Union will be finalized. Information on the Assembly schedule and mode of organization will appear at *www.iugg2011.com*. It is already time for you to be considering participating in the Assembly and also to be considering who should be nominated (through your National Representatives) as officers of the Association for the period 2011–2015.

International Network of Water Training Centres

The International Network of Water Training Centres has just launched an electronic newletter. The network's website is at:

www.inwtc.org

The network aims to bring together training organisations and others concerned with professional training in the water sector.

IWRM 2010

5th International Symposium on

Integrated Water Resources Management:

Water Resources Sustainability in a Changing Environment

Organized by ICWRS/IAHS in Nanjing, China, 19–21 November 2010

Abstract submission deadline: 15 April 2010

There is hardly a process on Earth where water is not involved in some form or another. Life on Earth is a water-processing system. Evidence is building that human-induced climate and land-use/cover changes have a direct influence on processes and elements of the hydrological cycle. Human activities impact water supply and increase water disasters. The International Commission on Water Resources Systems (ICWRS) of IAHS has, for many years, embraced Integrated Water Resources Management (IWRM) as the main topic for its research agenda. The ICWRS has organized regular symposia on Integrated Water Resources Management. The series of symposia on IWRM started at the University of California, Davis, USA, in 2000. The second symposium was organized in Stellenbosch, South Africa in 2003. The third and fourth ones were held at Ruhr-University, Bochum, Germany in 2006, and in Johannesburg, South Africa in 2008, respectively.

The fifth International Symposium on IWRM will be held at Hohai University, Nanjing, China, 19–21 November 2010, focusing on the topic *Water Resources Sustainability in a Changing Environment*. The objective is to bring together experts from different disciplines to present research results on describing the hydrological cycle in a changing environment and discriminating among impacts caused by various factors, to exchange experiences about quantitative methodology for water resources assessment in a changing environment and eco-hydrological approach to water resources sustainability by balancing water for humans and nature, so that we ensure water security in a changing background.

The symposium incorporates the following four themes:

Theme 1: Hydrological processes in a changing environment

Theme 2: Water resources assessment in a changing environment

Theme 3: Quantitative methods for integrated water resources management

Theme 4: Ecohydrological approach to water resources sustainability

Contact: Prof. Liliang Ren, *iwrm5@yahoo.com.cn*

http://shxy.hhu.edu.cn/IWRM5.htm

Report from the International Commission on Water Quality

Water quality has a high international profile in 2010. The theme for World Water Day on 22 March is *Clean Water for a Healthy World* with the aim of raising awareness amongst politicians of water quality as well as water quantity. Further information about World Water Day 2010 is at: www.unwater.org/worldwaterday/. In a similar vein, the theme of the 2010 World Water Week in Stockholm, 5–11 September will be *The Water Quality Challenge – Prevention, Wise Use and Abatement* (www.worldwaterweek.org).

In 2011 there will also be many opportunities for those working in the field of water quality to present their work at the XXV IUGG General Assembly in Melbourne, Australia, 28 June–7 July. ICWQ has been actively involved in preparations for the scientific programme for the Assembly with ICWQ committee members leading and assisting with a number of symposia and workshops. Topics will cover all aspects of water quality, including: water quality and changing climate, water quality prediction in ungauged basins, water quality in megacities, green and blue water, the coastal zone, groundwater recharge, and modelling of integrated groundwater, surface water and ecological systems.

Kate Heal, School of GeoSciences, Secretary ICWQ
The University of Edinburgh, Scotland, UK

Water quality of the Tawi Lift Irrigation Project, India: A Matter of Concern

The Tawi Lift Irrigation Project was started about four decades ago to irrigate land in the drought prone Kandi region of Jammu and Kashmir, India. The water is lifted with pumps from the River Tawi, near Jammu city, and is fed to a canal system. The route of the canal was sparsely populated when the scheme was implemented but now there are many houses and shops, as well as vegetable and fruit markets, present on both sides of the canal. In the 1970s the quality of water in the canal was similar to that of the River Tawi at the point of uplift; suspended solids concentrations varied from about 1000 to 3000 mg L^{-1} during the rainy season, and from trace concentrations to 400 mg L^{-1} in winter. However, now, 40 years after the project was commissioned, the canal has become a dumping ground for household wastes and effluents, industrial effluents, spoiled vegetables and fruit from the markets, dairy farm wastes and, more dangerously, plastic bags. Seasonal rainfall flushes pollutants from the surrounding catchment into the canal. The suburban and rural populations have no access to sanitary latrines and practice defecation in the open, causing bacterial and viral pollution of soil and water. There is no proper system of garbage collection and disposal and, by and large, all this finds its way to the canal. The sediment and pollutant load to the canal water has increased two to three times compared to four decades ago. The bottom of the canal is filled with silt and waste to the extent that it requires extensive de-silting every year to allow water flow. Moreover, the plastic bags disposed of in the canal, have impeded water movement in the canal and when carried to fields with irrigation water create problems in sowing and other cultivation operations. The irrigation water has now become a source of pollution in the fields and enables the breeding of flies and mosquitoes, causing health problems for the local population, such as malaria, diarrhoea, dysentery, cholera, jaundice, typhoid, particularly during the rainy season. The Government of Jammu and Kashmir banned the use of plastic bags in late 2009, but the order has not been enforced and the use of plastic bags continues unabated. There is a need for proper implementation of this order and for awareness programmes to educate the public about the pollution problem. The objective of a water supply is defeated if people are not simultaneously educated and motivated to maintain the water supply free of contaminants. Improper drainage and dumping of sewage, household wastes and effluents and industrial effluents in the canal water needs to be prevented with immediate effect through suitable legislation.

A large mass of silt, waste material and plastic bags accumulated around a small pole in the canal

Dr Uttam C. Sharma, Vice President ICWQ

Further Reports from Hyderabad – September 2009

Note: Several reports were published in the previous newsletter.

JS3 – Improving Integrated Surface and Groundwater Resources Management in a Vulnerable and Changing World

This Symposium was organised by the International Commission on Water Resources Systems, ICWRS, together with the international commissions on Water Quality (ICWQ), and Remote Sensing (ICRS) and the International Association of Hydrogeologists (IAH). The broad coverage and the multi-facetted nature of the subject area were reflected in the large number of contributions to the symposium drawn from a range of disciplines. Out of the contributions, 25 papers were selected for oral presentation and 65 for poster presentation.

The oral part of the Symposium started with a keynote lecture by Peter Dillon which dealt with managing aquifers to sustain irrigation, with examples from Australia, India and the Philippines. The following sessions dealt with various aspects of Water Resources Management. The first was related to water resources availability where the focus, in the main, was on assessing the water budget of catchments and aquifers, and managing their quantitative aspects. This included case studies on artificial recharge. Water for food was singled out as an individual session because of its importance at the global scale. The emphasis was on the effect of crop production on water resources and suitable methods of managing water for irrigation purposes.

The next session took a closer look at the water quality of both surface water and groundwater, including salt water intrusion problems. Floods and droughts were the focus in the next session. Change assessment and management is a particularly timely issue. The main subjects in this block dealt with the effects of water works on streamflow and the groundwater regime, changes in erosion and land cover, and climate change. The following session dealt with methodological aspects of monitoring and optimisation, including the use of satellite data. The optimisation studies focused on the mathematical aspects of integrated water resources management. The final session was on integrating water resources management involving issues of water demand, water allocation and policies, as well as adaptive management strategies.

The symposium was very well attended. All oral presentations were given by the author or by standby speakers. The poster session was also successful and it was noted that it was particularly useful to have a large number of posters in the poster session area at the same time.

A Red Book, IAHS Publ. 330, was produced, based on the contributions, and includes 50 papers.

Convenors:

Günter Blöschl, Vienna University of Technology, Austria
Nick van de Giesen, Delft University of Technology The Netherlands
D. Muralidharan, NGRI, India
Liliang Ren, Hohai University, China
Frédérique Seyler, IRD, France
Uttam Sharma, Center for Natural Resources Management, India
Jaroslav Vrba, DHV CR Consulting, Czech Republic

The Red Book is **IAHS Publ. 330** (*2009*)
ISBN 978-1-907161-01-8, 382 + x pp. Full price £71.50.

JW2 – Transboundary Water Management: Science and Policy

This meeting, which was sponsored by UNESCO-IHP-ISARM and the IAHS International Commission on Groundwater, was convened by: Shammy Puri (IAH, UK), Alice Aureli (UNESCO, Paris), Eberhard Braune (South Africa), Deborah Hathaway (USA), Youba Sokona (Mali/Tunisia), Clifford Voss (USA), Surin Workakijthamrong (UK) and Yongxin Xu (South Africa).

Rationale for the Workshop

The session focused on the science and policy of transboundary aquifers and their interactions with surface water. Almost 40% of the world's population lives in a transboundary river basin and nearly 60% of global fresh surface waters flow across an international boundary. The recently published *UNESCO Atlas on Transboundary Aquifers* indicates that there are 273 such systems in all continents. The scientific and legal issues that affect the management of these shared waters have attracted interest for years, yet intergovernmental agreements remain immature. The one international legal instrument on transboundary water developed between 1970 and 1997 by the United Nations International Law Commission (UN ILC) remains unratified. However, the ILC recently drafted legal Articles on the use of transboundary aquifers for adoption by governments. In a UN General Assembly Resolution these Articles have been noted and Governments are encouraged to adopt and implement them. In 2011 the General Assembly will again review these Articles with a view to possibly creating a Convention. This Workshop contributed to the debate on improving the science and policy needed to manage transboundary aquifers and associated waters by bringing together scientists, engineers, managers, lawyers and policy makers.

Programme of presentations and debate

The meeting programme was discussed and agreed by the convenors, and it was structured into five themes:

Theme A: Global perspectives on the management of transboundary water resources: what has been done and what is planned over the next decade

Two papers were presented under this theme:

Alice Aureli & Bhanu Neupane: *Three decades of scientific development of hydrology – how has this helped to ameliorate transboundary water related conflicts* (keynote)

Shammy Puri: *"Science to Policy in Transboundary Waters" Taking the science of hydrogeology through to international policy instruments – how hydrologists/ hydrogeologists participate: Setting the scene*.

The two presenters discussed the current situation with regard to the management of transboundary water resources stressing that a significant amount of work has been carried out in the past three decades that underpins the findings and the proposals to develop policy. In the discussion that followed, the participants stressed that science and the views of the scientists need to be better reflected in the policy that is being developed.

Theme B: Social and political aspects that affect the way transboundary waters are managed

Acma, Bulent (Turkey): *Water security in the Middle East: a case study the Euphrates and Tigris rivers*

Yawson, *et al*. (Nigeria): *Participatory development of a water charter for sustainable and equitable management of land and water resources for Komadugu Yobe basin*

The above papers were not presented at the meeting due to the absence of the authors. Nevertheless the issue is important and some discussion took place under other themes that relate to social and political aspects of transboundary water resources.

Theme C: Regional perspectives on the management of transboundary water resources

Chulli, B., *et al*. (Tunisia): *Tranboundary water resources management benefits sharing between Tunisia, Algeria and Libya "Aquifer NWSAS"*

Karimov, A., *et al*. (Uzbekistan): *Groundwater banking: an option for balancing transboundary hydropower – irrigation trade-offs in the Syrdarya River basin*

Peck, *et al.* (South Africa): *Preliminary study of the Auob transboundary aquifer in the southeast Kalahari/Karoo basin*

Han, Z., *et al*. (China): *Transboundary aquifers in the Greater Mekong River basin, south-east Asia*

The authors presented their perspectives on the management of transboundary water resources. The case histories show the range of issues that need to be taken into account, though there are many consistencies in the approaches adopted. The first three relate to regions of water scarcity and insufficient access to water. Here the storage available in the aquifers provides good opportunities for overcoming seasonal and inter-year deficiencies. An innovative and very well structured approach is proposed for the Syrdarya basin: that of storing the excess winter flows in aquifers for utilisation in the summer growing seasons. In the SE Asian region the value of incorporating aquifers in water resources management is slowly gaining recognition.

Theme D: Science to policy: what we know and what we need to know

Normatove, *et al*. (Tajikistan): *Water resources of the Central Asia transboundary rivers and their use in modern conditions*

Sivakumar, B. (USA): *Management of transboundary waters: science, politics and the public*

Ghosh, B. (Canada): *An environmental management approach to inter-connect rivers in India*

Hathawaya, D. J., *et al*. (USA): *Transboundary groundwater policy: developing approaches in the western and southwestern United States, including border regions*

The authors of the theme set out the linkages of science to the developing policies in their regions. In the case of India there remain tensions between the collection and dissemination of data. There are reasons for the lack of data dissemination which hinder research by independent scientist and others. The fear that data might be used against the decision makers is prevalent in many parts of the world. Even though there are repeated calls to make the data accessible, difficulties are placed using the information for informed debate.

Theme E: National perspectives: inventories carried out for improving international cooperation

Podolny, O. (Kazakhstan): *Transboundary groundwater of Kazakhstan: problems of monitoring and assessment*

Zekster, *et al*.: *Transboundary aquifers in Russia (state of the art and tasks for investigations)*

Collmann, *et al*. (Germany): *Evaluating the effect of glacier melt on the hydrological regime of a transboundary watershed*

Chadha, D. K. (India): *Transboundary aquifers of India*

The national perspectives presented by the above authors indicate that a significant effort is underway in many regions to compile information for the preparation of both national and international inventories of transboundary water resources. A range of approaches is used, such as in Kazakhstan, where hydrogeological data are often disconnected from the surface water data and therefore the management is in different institutions. In the case of India there was a discussion on whether all of the information of transboundary resources should be made available to neighbouring states, or only the portions that are affected by near-boundary conditions.

Convenor: S Puri

JW4 –Workshop on Tracers in Hydrology

During the International Commission on Tracers workshop, JW4, we had 16 oral presentations in four sessions and 10 posters. Six of the planned oral presentations were cancelled, but the convenor invited Dr Kralik from Austria and Dr Schumann from Germany (Mrs Schumann's presentation was planned for the poster session), to present their work and fill the programme. The oral presentations came from 11 countries, which represented four continents (Europe, 5; Australia & New Zealand, 4; Asia, 3; North America, 2). The presentations were performed by three PhD students and six young scientists. In each session, 45–50 specialists were present in the auditorium. The presented papers covered branches of hydrogeology and hydrology. They included reports on the tracer approaches and studies in different countries of Europe, Asia and America, as well as an overview of how tracer techniques contribute to the understanding, quantification and modelling of flow and transport processes in complex hydrogeological systems, and how they are used in practical approaches to assessing groundwater quality, protection methods, solutions to contamination problems, and waste disposal impact studies, at different temporal and spatial scales.

The presentations showed how tracers have been applied to a variety of problems in hydrology. Most of these studies deal with the determination of pathways, formation rates and mean residence times of certain water masses:

- studies for modelling dispersion, transport, existing contamination and protection measures
- techniques, methodologies and results on tracer behaviour
- modelling for assessing reactive transport, organic contamination and natural attenuation
- modelling of double porosity, macropores and fractured/karstified rocks
- studies of infiltration, recharge and hydrological processes in the unsaturated zone
- studies and modelling of regional groundwater systems
- studies for investigating groundwater–surface water interactions

The workshop provided an excellent overview of current research, mainly at the global scale. One significant trend in

the research is toward sustained long-term monitoring of precipitation and river discharge to enable better characterization of spatial and temporal variability in isotope signatures and their underlying causes. One fundamental conclusion drawn from the studies is that combined use of $\delta^{18}O$ and $\delta^{2}H$ enables the distinction of precipitation variability from evaporation effects, which offers significant advantages over use of the individual tracers alone. The study of hydrological controls on water chemistry is one emerging research trend that stems from the unique ability to integrate isotope sampling within both water quality and water quantity surveys.

Convenor: P. Maloszewski (VP)
G. M. Zuppi, President

HW2 – Sediment Problems and Sediment Management in Asian River Basins

This two-day workshop was a joint venture between the ICCE (International Commission of Continental Erosion), the World Association for Sedimentation and Erosion Research (WASER) and the UNESCO International Sediment Initiative (ISI). The involvement of the UNESCO ISI was particularly important as UNESCO provided funds to support the attendance of seven invited speakers who presented overview papers relating to sediment problems in their home countries or local regions.

Notwithstanding certain problems with the programme, the Workshop was judged to have been very successful and to have achieved its objectives. The presentations were structured into two main groups, each occupying a day. The first day was devoted to invited papers that included an overview of the activities of the ISI presented by the chairman of the ISI Steering Committee, Professor Manfred Spreafico, and contributions from invited speakers from India, Iran, Singapore, Taiwan, Nepal, Vietnam and Bangladesh. These invited contributions focused on the key sediment problems in those countries or particular regions and additionally provided valuable perspectives on issues such as: the design of sediment management and control programmes, the impact of climate change on sediment loads, the role of sediment fluxes in the global carbon budget, and the problems of integrating and reconciling the roles of farmers and reservoir managers for improved catchment management. By providing extended time slots for these invited presentations it was possible for the authors to provide substantive overviews in their presentations and to develop useful discussion after the presentations. All the invited speakers were present at the Workshop.

The second day of the Workshop was devoted to presentations based on submitted abstracts. An explicit attempt had been made by the convenors to establish contact with the presenters prior to the Workshop to confirm their attendance and to thereby minimise the number of no-shows. These efforts proved reasonably successful, in that there were only three no-shows amongst the 14 papers listed, and there was therefore no significant disruption of the programme by the absence of these speakers. To provide an effective basis for Workshop discussion, each of the presentations on the second day was allocated a total of 20 minutes, providing about 15 minutes for the presentation and 5 minutes for subsequent discussion. The papers presented were of a good standard and covered a wide range of important topics and issues ranging from the problems of managing erosion of lake shores and sand mining as an environmental problem, through modelling and predicting catchment sediment yields and reservoir sedimentation and the role of agricultural activity in causing aggradation of small rivers in Siberia, to defining baseline erosion rates and recent changes in the sediment load of the Mekong River.

The problems with the programme did unfortunately impact on the poster presentations as the timing of this differed from that on the programme produced and pre-circulated by the convenors.

Convenor: Des Walling

HW6 – Precipitation Variability and Water Resources

Workshop HW6, convened by D. Schertzer, S. Lovejoy, E. A. Smith and N. Shingh, received 42 abstracts, including 18 selected for oral presentations, 6 for oral reserve and 12 for poster presentations. The large response to the call for papers was presumably due to its focus on a key problem of water resources under stress, the latter being the conference theme. Indeed, it focused on quantifying the variability of precipitation and precipitation surrogates over wide ranges of space–time scales, including the nature of precipitation extremes, non-stationarities, and uncertainties. It provided an opportunity to discuss new observational and data processing techniques for *in situ* networks and/or for remote sensing, new modelling approaches, including climatological/ meteorological models, rainfall stochastic and/or scaling models, as well as how to better confront models to data. A particular emphasis was placed on various space–time scales that are involved, and techniques that allow observation, analysis and simulation across scales.

The oral presentations were scheduled on Friday 11 September (the last day of the conference) with poster presentations throughout the day.

Unfortunately, as for other sessions, there had been numerous last-minute dropouts by presenters (45%) and convenors (75%), due to both compelling professional commitments (beginning of the autumn term) and some travel problems in reaching the venue. Fortunately, P. Givone, a representative of the French IAHS committee, agreed to organize the session on the spot, and to chair it with N. Shingh, the only convenor who as able to attend the meeting. P. Givone's organising resulted in a reasonable number of oral presentations, and extended time for discussions. The rather high attendance of the session, i.e. never less than 20 to 25, tends to confirm the quality of the choices made in both directions.

The first session focused on rainfall modelling and uncertainty evaluation in various areas in the world, at the rather regional scale. The second focused on statistical analysis and included, in particular, an excellent presentation realized in real time by Kevin Shook on *Trends in the multiscaling of temperature and precipitation in the Canadian prairies*. The last session addressed the detection of changes and trends, and it was the busiest. Bruno Schädler made an excellent presentation on *Estimation of accurate precipitation in mountainous areas – a prerequisite for water resources management*.

10th Kovacs Colloquium / 10ème Colloque Kovacs, UNESCO

Hydrocomplexity: New Tools for Solving Wicked Water Problems

Hydrocomplexité: Nouveaux outils pour solutionner des problèmes de l'eau complexes

UNESCO, Room IV, 7 Place de Fontenoy, 75007 Paris, France, 2–3 July 2010

PROVISIONAL SCIENTIFIC AGENDA

Friday/Vendredi, 2 July/Juillet 2010	Saturday/Samedi, 3 July/Juillet 2010
8:30 Registration 9:30–10:30 Opening Ceremony Introduction	9:00–9:45 Chair: Hector Malano **Speaker: Sonoda Nakajo** Spiral approach to IWRM
10:30–11:00 Coffee Break	*10:30–11:00 Coffee Break*
11:00–11:45 Chair: S. Demuth **Speaker: Eugene Z. Stakhiv** Water management under climate change uncertainty	11:00–11:45 Chair: P. Hubert **Speaker: Lotta Andersson** Participatory scenario modelling
11:45–12:30 Chair : H.H.G. Savenije **Speaker: W. James Shuttleworth** Back to basics of understanding ET	11:45–12:30 Chair: S. Samarasinghe **Speaker: Huili Gong** Integrated monitoring and modelling challenges
	12:30–13:15 Chair: J. Cullmann **Speaker: Sandhya Samarasinghe** Water systems analysis
12:30–14:00 Lunch Break	*13:15–14:30 Lunch Break*
14:00–14:45 Chair: G. Young **Speaker: Richard Taylor** Global change impact on groundwater	14:30–15:15 Chair: S. Khan **Speaker: Janusz A. Starzyk** Motivated machine learning
14:45–15:30 Chair: Eugene Z. Stakhiv **Speaker: F. Fenícia** Model accuracy and predictive capability	15:15–16:00 *General Discussion*
15:30–16:00 Coffee Break	16:00 *End of Colloquium*
16:00-16:45 Chair: A. Tejada-Guibert **Speaker: Saket Pande** Parsimonious modelling approach	In addition to the invited presentations, posters along with extended abstracts (2 printed pages maximum) are also welcome. The abstracts (in English or French) should reach the Colloquium Secretariat (see below) by **12 April** at the latest
16:45–17:30 Chair: Lotta Andersson **Speaker: Hector M. Malano** Integrated modelling	

The invited speakers will deliver presentations on the state of the art of aspects of the hydrocomplexity and tools, identifying areas where gaps exist, and outline areas for future research and application. Open discussion will then take place. In addition to the technically water-orientated contributions, the programme will include more general methodological presentations of the underlying concepts from policy and water management perspectives. Such perspectives will be the basis for establishing the practical questions to be addressed by water management tools and to explore new horizons in trans-disciplinary water sciences.

Although there is no charge to attend, ALL participants must register. Full details of the meeting are available at:

www.iahs.info/conferences/2010Kovacs.htm

including the registration form, programme, biographies of the speakers, poster details, etc.

The contact at UNESCO is Mrs Georgette Gobina: *g.gobina@unesco.org*

The Water Resources of South Africa, 2005 Study (WR2005)

Continued from page 1

At the heart of the analysis is the most widely accepted rainfall–runoff model in South Africa, called the Water Resources Simulation Model (WRSM2000), developed by Dr Bill Pitman, and often referred to as the Pitman model. This model has been used extensively for a number of decades in South Africa and some surrounding southern African states. All catchments in South Africa, Lesotho and Swaziland were analysed using this model on a quaternary catchment scale (1946 in number and covering 1 365 464 square kilometres) and using a monthly time step. Apart from the groundwater/surface water interface, the WRSM2000 model was also enhanced with the latest methodologies for afforestation, alien vegetation, irrigation and wetlands as part of the WR2005 project. Alien vegetation has been identified in South Africa as a significant water user and an organization called Working for Water is actively involved in removing alien vegetation in certain stressed catchments. Areas of alien vegetation are normally identified by examining satellite imagery.

The WRSM2000 model is based on five types of module, namely: runoff, reservoir, irrigation, mining and channel modules, linked together by routes. Once all the required input data have been entered into the model, a simulated flow record can be obtained and compared to an observed flow record by means of graphical plots and statistical parameters. By adjusting the values of 13 calibration parameters governing the principal processes of runoff generation, the user can obtain a simulated flow record as close as possible to the observed. A view of a yearly hydrograph showing observed and simulated streamflow is shown below.

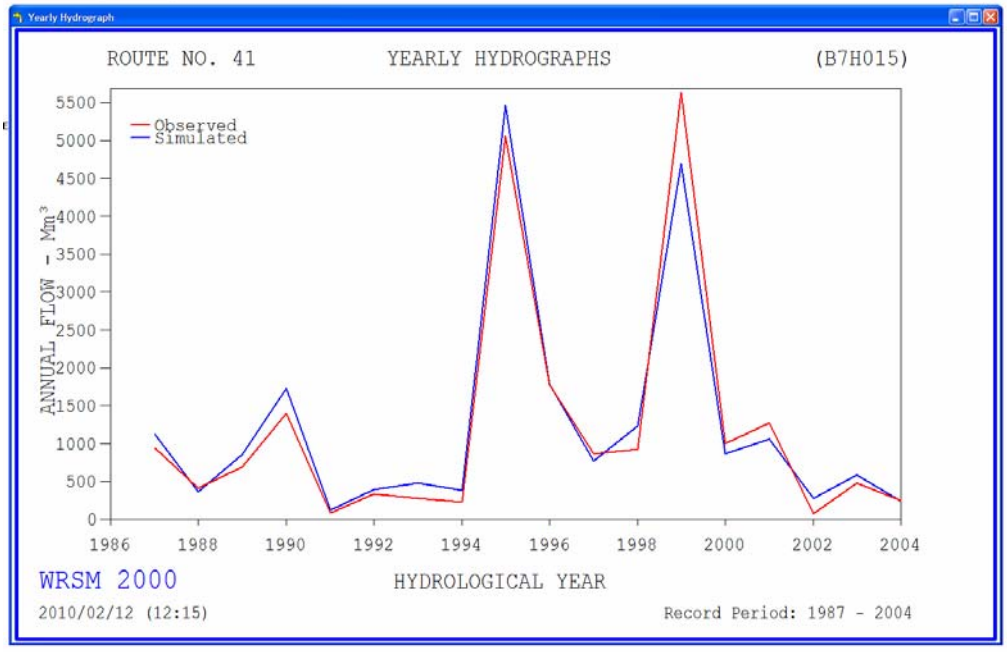
GIS maps were also developed which provide a wide range of water resource data sets, both electronically and in hardcopy format. The information produced by this study has been set up in a database, containing reports, spreadsheets, GIS maps, etc., which are all accessible from a user-friendly menu-driven system.

One of the outcomes of this recent appraisal was that there is 3.7% less water available within South Africa in comparison with the previous water resources appraisal. This finding has significant implications for a country where demands are greater than available water resources in some catchments, and interventions such as re-use, water conservation and demand management, desalination, water transfers and construction of dams need to be considered.

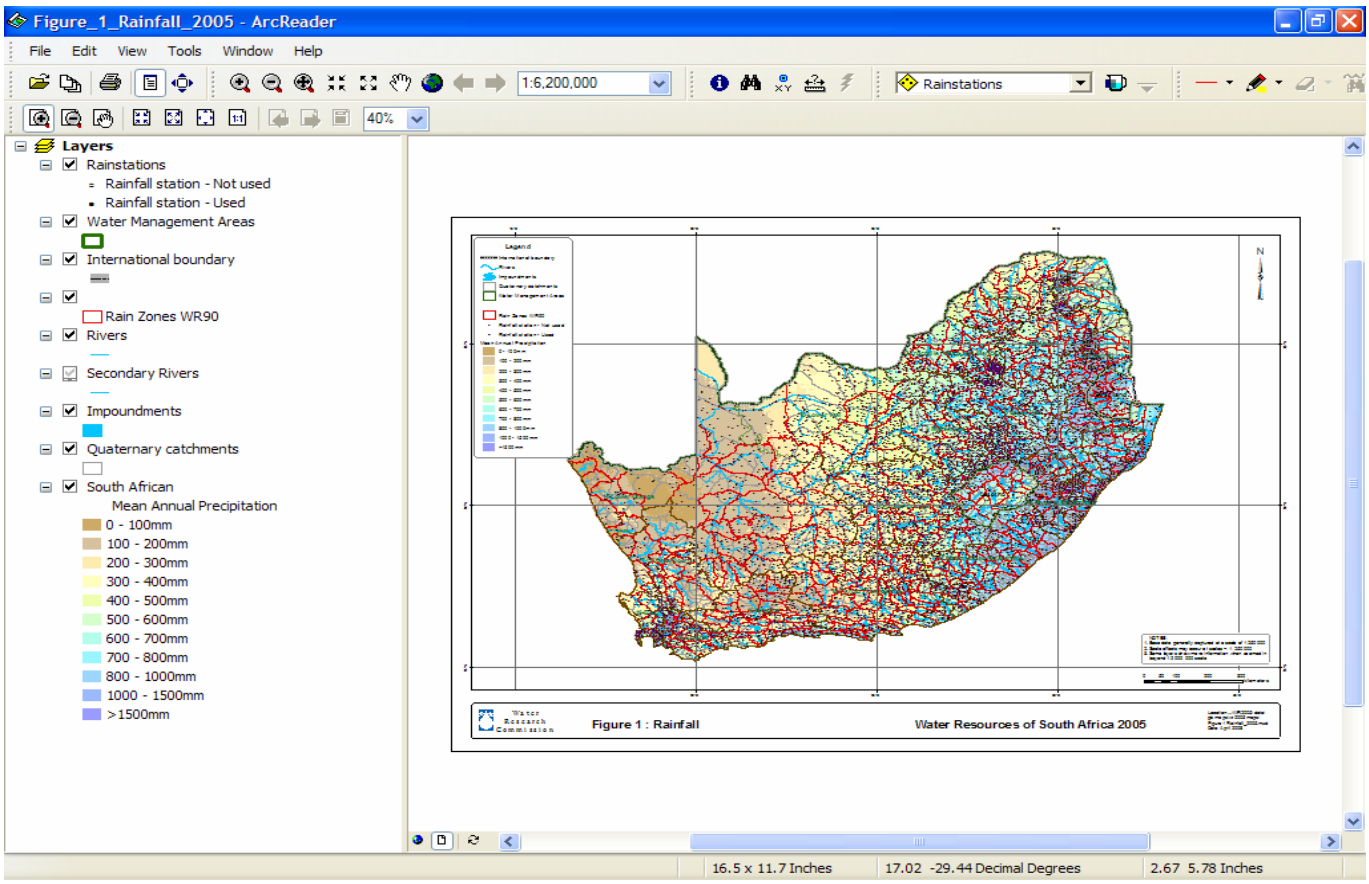
The previous water resources appraisal dealt only with surface water. This appraisal has incorporated recent research by Prof. Denis Hughes and Mr Karim Sami by the inclusion of their groundwater–surface water methodologies and groundwater data based on a quaternary catchment scale. These data include transmissivity, storativity, aquifer thickness and storage, recharge, discharge, percolation, hydraulic gradient, static water level, interflow lag and abstractions from boreholes. Graphs and time series data for various groundwater parameters can be examined. The impact of the groundwater/surface water interface on stream-flow is still in the early stages of evaluation and can differ quite appreciably depending on varying catchment conditions. It is anticipated that a lot of research will still be done to compare different methodologies, refine groundwater data and evaluate the effectiveness of the methodologies in modelling the complex processes of groundwater–surface water interaction.

A water quality model was developed to provide information covering the entire study area for a range of observed water quality parameters including salinity, sulphates, phosphates, pH and fluorides. Stressed catchments with the worst salinities were modelled. Graphs and statistics of flow, TDS and load were produced in order to compare observed and simulated values. Simulated values are valuable to researchers where observed data do not exist over certain periods.

The study output was provided as GIS maps in ArcGIS for base map, rainfall, runoff, evaporation, land cover, inter-



An example of the yearly streamflow hydrographs which the WRSM2000 model can produce



basin water transfers, geology, sedimentation, soils, vegetation, ecological water requirements, surface water quality (TDS), population density, groundwater exploitation potential and calibration parameters. An example of a GIS map of rainfall is given above.

The WR2005 study was handed over to the South African Water Research Commission at the September 2009 SANCIAHS conference.

It is envisaged that these products will greatly facilitate the analysis of integrated water resources across the country for a wider range of users than was the case with the previous appraisals.

Allan Bailey, Bill Pitman and Francis Gibbons
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Johannesburg, South Africa

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Isotopes and Tracers in Hydrology and the 2009 Henry Darcy Lecture

Report of an international symposium organized by the Netherlands' National Committee IHP-HWRP and the VU University Amsterdam, together with the Netherlands Hydrological Society (NHV), the Netherlands' Chapter of the International Association of Hydrogeologists (IAH), and the US National Ground Water Research and Educational Foundation (NGWREF)
5 November 2009, Amsterdam, The Netherlands

Isotope hydrology is a field of hydrology that uses isotopic dating to estimate the age and origins of water and of movement within the hydrological cycle. The techniques are used for water-use policy, mapping aquifers, conserving water supplies, and controlling pollution. It often supplements past methods of measuring rain, river levels and other bodies of water.

Environmental tracers can reduce uncertainty of hydrological predictions in all environments, but are particularly valuable in highly heterogeneous groundwater systems, where spatial variations in aquifer hydraulic conductivity may range over several orders of magnitude, and so hydraulic approaches are inherently uncertain. Despite the rapid growth of environmental tracers during the past few decades and their adoption by the research community, they are not widely used in routine hydrogeological assessments.

On 5 November 2009, the Netherlands National Committee IHP-HWRP and the VU University Amsterdam, together with the Netherlands Hydrological Society (NHV), the Netherlands' Chapter of the International Association of Hydrogeologists (IAH) and the US National Ground Water Research and Educational Foundation (NGWREF), organized a symposium on recent progress in the use of environmental isotopes and other tracers in hydrological research.

Seventeen years earlier, on 19 November 1992, the Netherlands Hydrological Society had organized a meeting on isotopes in hydrology, which resulted in the first special publication[1] of the society. Also, the VU University has a longstanding record of courses in isotope hydrology, most importantly those given by Prof. W. G. Mook. His university reader was expanded and subsequently published by IAEA and UNESCO in six volumes[2]. This was a major contribution of the Netherlands to the framework of the International Hydrological Programme (IHP) of UNESCO. The publication series *Environmental Isotopes in the Hydrological Cycle: Principles and Applications* is still an important reference for many students worldwide.

Dr Vincent Post, VU University, welcomed the participants as a good host and gave a short introduction on developments in the isotope and tracer courses taught at the VU University in Amsterdam. This started with the course by Prof. Wim Mook and his earlier-mentioned reader. Dr Post reiterated the importance of isotopes and tracers in the verification of models.

Introduction to the use of environmental isotopes and tracers in hydrology

Prof. Stefan Uhlenbrook, VU University Amsterdam and UNESCO-IHE Institute for Water Education

As first speaker, Prof. Stefan Uhlenbrook introduced the use of environmental isotopes and tracers in hydrology. He aptly put this in the framework of the many changes that the world is undergoing: global change including climatic change and changes in land use. Looking at the equations for precipitation, interception, surface water, soil moisture and groundwater, changes are possible for all parameters. Environmental isotopes can be used to investigate the various components of the water cycle and for validation of models of the water cycle.

Prof. Uhlenbrook concluded that the world is changing, and so should hydrology. Environmental isotopes can help us to understand changes and their impacts. The use of isotopes provides innovative ways to observe hydrological processes, in particular in combination with other methods such as geophysics and models. Whereas today the focus of water-related isotope research is mostly in the usage of ^{18}O, ^{2}H and ^{3}H, components of the water molecule, the current trend is towards "isotope biogeochemistry" using ^{15}N, ^{13}C and ^{34}S, or other dating techniques using noble gases or metals.

Environmental tracers in modern hydrogeology: reducing uncertainty in groundwater flow estimation

Dr Peter Cook, 2009 Darcy Lecturer, CSIRO Land and Water

In his lecture, Dr Peter Cook illustrated the potential of environmental tracers through illustration using field sites in North America and Australia, and discussed methods for bridging the gap between research and practice.

Quantitative hydrogeology is often traced back to Darcy who, in the mid-19th century, observed a linear relationship between flow rate and hydraulic gradient, the proportionality constant later becoming known as hydraulic conductivity. Even today, groundwater flow rates are most frequently determined as the product of measured hydraulic gradients and hydraulic conductivities, the latter determined using pumping tests. Although the past 150 years have seen considerable improvements in interpretation of pumping tests, and understanding of isotropy and heterogeneity, estimation of aquifer hydraulic conductivity values at appropriate scales remains a significant source of uncertainty. Within the past few decades, however, environmental tracer methods have been developed that can provide independent estimates of groundwater flow rates, which have helped to overcome some of the problems associated with hydraulic approaches, particularly in heterogeneous systems. However, despite the ability of environmental tracers to constrain conceptual models of groundwater systems and significantly reduce uncertainties in prediction, the methods are underrepresented in hydrogeological textbooks, and are still not widely used for hydrogeological assessment.

There is a large number of environmental tracers, all with different properties and hence different potential uses.

1 Van der Valk, M. R. (2002) Isotopen in de hydrologie: the state of the art (in Dutch); NHV-special 1, Nederlandse Hydrologische Vereniging, Delft, The Netherlands.103 pp.

2 The complete six volumes of *Environmental Isotopes in the Hydrological Cycle: Principles and Applications*, can be downloaded free of charge from www.hydrology.nl.

While environmental tracers that readily undergo chemical reactions can sometimes be used to determine reaction pathways, tracers that behave more conservatively may yield information on transport processes. The calculation of groundwater residence times is one of the more common applications. Tracers that can be used for this purpose include radioactive isotopes, which decay at a known rate (e.g. ^{14}C, ^{3}H), tracers that are produced and accumulate in the subsurface (e.g. He), and tracers that are neither produced nor consumed in the subsurface, but have a variable and well-known input history (e.g. CFCs, SF_6). Groundwater residence times in unconfined aquifers can be used to infer aquifer recharge rates, whereas in confined aquifers they allow quantification of horizontal flow velocities. Tracers present in much higher concentrations in groundwater than in surface water have great potential for quantifying groundwater discharge to surface water. In particular, dissolved gas tracers such as radon and helium will rapidly volatilise from surface water and so provide important tracers of recent groundwater inflow. Radon (with a half-life of 3.8 days), in particular, can be used in quantifying rates of groundwater discharge to streams, wetlands, and to the ocean, and also to determine the rate of water exchange between a river and its underlying hyporheic zone.

Dr Cook excellently showed the impact of magnitude and scale on hydraulic properties. The various techniques available for different situations, including the coupling of tracers with more "classical" hydraulics, were clearly explained. Where previously isotopes and other tracers were used as a reconnaissance tool in remote areas, with quantitative interpretation based on highly idealized models, there is nowadays an important role for tracers used in conjunction with hydraulics to improve prediction, particularly in heterogeneous groundwater systems. Given the general lack of uncertainty analysis in hydrogeology, tracers can improve accuracy of prediction in heterogeneous environments.

Dr Cook concluded that in homogeneous aquifers, both hydraulic and environmental tracer approaches can accurately characterize groundwater flow. In heterogeneous aquifers, tracers may have advantages over hydraulics because they provide spatially averaged information. In moderately heterogeneous aquifers, environmental tracers can be used in conjunction with hydraulics, to improve calibration of groundwater models. In highly heterogeneous systems, uncertainty of hydraulics is so high that perhaps we have no alternative than to pursue environmental tracer methods for estimating rates of groundwater flow.

Multi-tracing of artificially recharged Rhine River water in the coastal dune aquifer system of the western Netherlands

Dr Pieter Stuyfzand, KWR and VU University, Amsterdam

The coastal dunes of the western Netherlands are locally recharged by pre-treated water from the River Rhine in order to supply drinking water to large cities such as Amsterdam, The Hague, Leiden, Haarlem and Alkmaar. This has happened on a large scale since 1955, when the drawdown of groundwater tables and aquifer salinization became unacceptable. Ecological interests, and both national and EU legislation now compel the water utilities to monitor the expansion of the resulting artificial groundwater bodies amidst the surrounding, natural dune groundwater.

However, that monitoring requires multi-tracing techniques in order to unambiguously identify the infiltrated Rhine water amidst coastal dune groundwater, because both water types show a large variation in water quality yielding overlapping tracer contents. In addition, the identification is becoming more difficult due to a reducing contrast between both waters.

In his contribution Dr Stuyfzand showed the performance of various environmental tracers, both single and in various combinations (multi-tracing), for diverse levels of the aquifer system. Uncertainties in the discrimination were also quantified. He showed results of mapping the extension of the infiltrated Rhine water, with special attention to so-called rainwater lenses on top of laterally migrating Rhine water, groundwater dating, and hydrological information (hydraulic conductivity, dispersivity) as derived from the observed spatial patterns.

Dr Stuyfzand concluded that more tracer studies are needed in this specific case due to a strong increase of interaction between Rhine water and groundwater in the Netherlands, as a result of artificial recharge, land reclamation, polders, drainage, irrigation, shipping canals and river bank filtration. The best tracer combination of Rhine water in the Netherlands is Cl/Br + ^{18}O; the cheapest is HCO_3 in combination with electrical conductivity. Additional good tracers are ^{2}H, Cl and SO_4. Multi-tracing helps to reduce uncertainties in origin detection, deriving mixing ratios and hydrological models.

Degassing of $^{3}H/^{3}He$, CFCs and SF_6 by denitrification in the Netherlands

Dr Ate Visser, Deltares

Groundwater dating has proven to be a valuable tool for environmental research, for example for the demonstration of trend reversal in groundwater quality. Modern groundwater dating techniques are based on the transport of dissolved gases in groundwater, such as noble gases, CFCs or SF_6. These tracers are chemically inert, but are sensitive to the formation and flow of a gas phase below the groundwater table. A gas phase below the groundwater table, e.g. as the result of a geochemical reaction, causes secondary partitioning between the water and gas phase and obstructs the conservative transport of groundwater age tracers. Ordinary methods to interpret groundwater age tracers are then no longer valid.

Since 2001, a total of 95 screens of the groundwater quality monitoring network in Brabant, the Netherlands, located 10 m or 25 m below the surface, have been sampled for $^{3}H/^{3}He$, 34 of which have also been sampled for CFCs and SF_6. About half of these samples showed the effects of noble gas depletion (degassing). The absence of nitrate in degassed samples indicated that denitrification had caused degassing. CFCs appeared to be subject to significant degradation in anoxic groundwater and SF_6 was highly susceptible to degassing. Therefore $^{3}H/^{3}He$ appears to be the most reliable method to date degassed groundwater.

Conclusion: Enormous opportunities for the use of isotopes in water resources research

As was stated by various speakers, research involving environmental tracers such as isotopes is still not common, let alone their monitoring on a regular basis. This is rather

unfortunate, as environmental tracers have the ability to constrain conceptual models of groundwater systems and significantly reduce uncertainties in prediction.

It was therefore good to see the broad attention given to the subject by participants from many different organizations, although participants were mostly working in research rather than in water management and water policy. The broad attention and the improved possibilities for relatively inexpensive analyses lead the way to more structural monitoring of essential parameters, possibly by governmental water managers, as part of the standard analyses suite. This would be to honour the importance and specific opportunities that isotopes and other tracers merit, amongst others, for the calibration of models, both in groundwater and surface water research and management.

Michael van der Valk

The presentations of the symposium can be downloaded from www.hydrology.nl.

The symposium was a contribution by The Netherlands to the International Hydrological Programme (IHP) of UNESCO and the Hydrology and Water Resources Programme (HWRP) of WMO.

Hydrological Sciences Journal

The first of the eight issues in volume 55 of *Hydrological Sciences Journal* is now published and available on the InformaWorld platform. Everyone may read the editorial and abstracts in this issue at:

www.tandf.co.uk/journals/thsj

or click on the link at the IAHS website; library and individual subscribers can see the full papers. The backfile, volumes 1–52 is available open access.

The late publication of this issue is a result of the care taken to ensure that it was produced to the highest standard; we anticipate more timely publication in future, with issue no. 2 expected at the end of March.

The online access to the journal for IAHS members in the poorest countries is being arranged and they will be informed personally, by email, as soon as the facility is ready.

CALL FOR PAPERS:

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27–30 September 2010

Snow King Resort, Jackson Hole, Wyoming, USA **Abstracts due: 16 April 2010**

For information and abstract submission go to: http://www.remotesensinghydrology.org/

Planned session themes:

- Remote Sensing of: Precipitation, Evapotranspiration, Soil Moisture and Groundwater
- Snow and Ice, Wetlands and Riparian Zones
- Hydrological Modeling and Forecasting using Remote Sensing Data
- Operational Hydrological Applications of Remote Sensing Data
- The Role and Importance of Large-Scale Experiments in Hydrological Understanding
- New Airborne and Satellite Sensors for Hydrological Monitoring and Modelling
- Passive Microwave and Radar Applications in Hydrology
- Remote Sensing and Ungauged Basins
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Come and participate in this high-level symposium on the state of the art of remote sensing applications in hydrology, while enjoying the beauty of the Rocky Mountains and Yellowstone and Teton National Parks.

For more information contact Christopher Neale (VP ICRS) christopher.neale@usu.edu

Sponsored by the IAHS International Commission on Remote Sensing

Calendar of Meetings Organized/Sponsored by IAHS and Its Commissions

2010	Conference	Contact details
Batna, Algérie 27–29 April	1er Séminaire international euro-méditerranéen sur l'aménagement du territoire, la gestion des risques et la sécurité civile	Dr Bouzid Tayeb, tel/fax: 00 213 33 869312; lrnat@yahoo.fr
Taormina, Italy 23–25 May	Advances in Statistical Hydrology	Sandra Lazzarini, Dept of Civil and Environmental Engineering, Viale A. Doria, I-95125 Catania, Italy; fax: +39 095 7382748; stahy2010@dica.unict.it
Ohrid, Macedonia 25–29 May	BALWOIS 2010	secretariat@balwois.org
Pisa, Italy 7–11 June	28th IUGG Conference on Mathematical Geophysics. Modelling Earth Dynamics: Complexity, Uncertainty and Validation	cmg2010.pi.ingv.it
Zurich, Switzerland 13–18 June	GQ10 Groundwater Quality 2010 Conference	Prof. Dr habil. Mario Schirmer, Eawag - Swiss Federal Institute of Aquatic Science and Technology; mario.schirmer@eawag.ch
Warsaw, Poland 14–18 June	International Symposium on Sediment dynamics for a changing future	Prof. Dr Kazimierz Banasik, SGGW; icce2010@sggw.pl
Constantza, Romania 16–19 June	Water 2010	Professor Carmen Maftei, cmaftei@univ-ovidius.ro
Coimbra, Portugal 23–25 June	Tenth International Conference on Precipitation (IPC10) Space-time Precipitation from Urban Scale to Global Change	Jao de Lima, ipc10@dec.uc.pt
Neuherberg, Germany 29–30 June	Workshop on Flowpath Characterisation	Prof. Piotr Maloszewski, Institute of Groundwater Ecology, Helmholtz Zentrum München, Ingolstädter Landstrasse 1, D-85764 Neuherberg, Germany tel: +49 8931872583; fax: +49 8931873361; maloszewski@helmholtz-muenchen.de
Paris 2–3 July	Tenth Kovacs Colloquium, UNESCO, Paris	Pierre Hubert, piy.hubert@free.fr; Shahbaz Khan, s.khan@unesco.org
Iguassu Falls, Brazil 8–13 August	Joint Assembly 2010. Meeting of the Americas Session U06: Hydrology from Space	Prof. Marcelo Assumpção, University of São Paulo, Brazil; marcelo@iag.usp.br LOC tel: +11 3361 3056; eventus.com.br
Vienna, Austria 5–8 September	13th ERB Conference. Hydrological Responses of Small Basins to a changing environment	Contact : Hubert Holzmann, BOKU, Vienna, Austria hubert.holzmann@boku.ac.at
Stellenbosch, South Africa 6–9 Sept.	11th International Symposium on River Sedimentation (ISRS)	Technical aspects: Prof Gerrit Basson grbasson@sun.ac.za; tel: +27 21 808 4355 Other aspects: Marechia Basson msb@aspt.co.za ; tel: +27 79 4909 210
Tianjin, China 7–11 September	9th International Conference on Hydroinformatics HIC2010	
Krakow, Poland 12–16 September	XXXVIIIth IAH Congress	Stanislaw Witczak, tel: +48 (12) 617 2437; witczak@uci.agh.edu.pl
Prague, Czech Republic 20–23 September	HydroPredict'2010 : 2nd International Interdisciplinary Conference on Predictions for Hydrology, Ecology, and Water Resources Management	Dr Zbynek Hrkal, zbynek_hrkal@vuv.cz; Prof. Hans-Peter Nachtnebel, hans_peter.nachtnebel@boku.ac.at http://www.natur.cuni.cz/hydropredict2010/
Jackson Hole, USA 27–30 September	Remote Sensing and Hydrology 2010	Christopher Neale (VP ICRS); christopher.neale@usu.edu
Fez, Morocco 25–29 October	6th World FRIEND Conference *Global Change: Facing Risks and Threats to Water Resources*	Eric Servat, friend2010@msem.univ-montp2.fr http://www.unesco.org/friend2010/water/ihp/pdf/_call_papers.pdf
Nanjing, China 19–21 November	IWRM 2010, 5th International Symposium on Integrated Water Resources Management : Water Resources Sustainability in a Changing Environment	IWRM5@yahoo.com.cn
Djibouti, Republic of Djibouti 22–25 November	ARGEO-C3, African Rift Geothermal Resources	CERD, PO Box n°486, Djibouti, Republic of Djibouti tel: +253 35 27 95; argeo-c3-djibouti@intnet.dj
Paris, France 6–8 December	International Conference on Challenges and New Directions in Transboundary Aquifers Management	

2011	Conference	Contact details
Algers, Algeria 21–23 Février 2011	4ème Colloque International sur les Ressources en Eau et le Développement Durable	Meddi Mohamed, Ecole Nationale Supérieure de l'hydraulique. BP 31, 09000 Blida, Algérie tel: +213 25 39 9447 / 9071; CIREDD4@ensh.dz or CIREDD4@gmail.com
Vienna, Austria 11–14 April 2011	The Status and Future of the World's Large Rivers	Helmut Habersack, helmut.habersack@boku.ac.at Des Walling, d.e.walling@exeter.ac.uk
Melbourne, Australia 27 June–8 July 2011	XXVth IUGG General Assembly	
Leipziger Kubus, Germany 19–22 September	ModelCare 2011, The 8th International Conference on Calibration and Reliability in Groundwater Modelling	modelcare2011@fu-confirm.de
Tsukuba, Japan 27–30 September	5th International Conference on Flood Management	

2013	Conference	Contact details
Göteborg, Sweden 22–26 July	Joint IAHS-IAPSO-IASPEI Scientific Assembly	

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Hydrological Modelling and Integrated Water Resources Management in Ungauged Mountainous Watersheds

Edited by *Wei-Lin Xu, Tian-Qi Ao & Xin-Hua Zhang*

IAHS Publ. 335 (*2009*) ISBN 978-1-907161-07-0, 310 + x pp. Price £65.00

The China Prediction in Ungauged Basins (PUB) organization was formed in 2004 and focuses on the new methodology of hydrological simulation and prediction under natural and human-induced global changes. The second International Symposium on Hydrological Modelling and Integrated Water Resources Management in Ungauged Mountainous Watersheds for IAHS-PUB was successfully held in November 2008. This volume of 41 selected papers is the result. The key issue is how to make predictions in ungauged or poorly-gauged mountainous basins with a major reduction in predictive uncertainties.