



## International Hydrology Prize awarded to first PUB leader, Murugesu Sivapalan

*For outstanding contributions to watershed hydrology and global leadership in advancing predictions in ungauged basins*

Professor Sivapalan (right) with Gordon Young who presented the prize during the Scientific Session of the International Hydrology Programme Inter-Governmental Council meeting in July at UNESCO, Paris. The prize is awarded annually by IAHS with the support of the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).



See page ?? for the full citation and Professor Sivapalan's response.



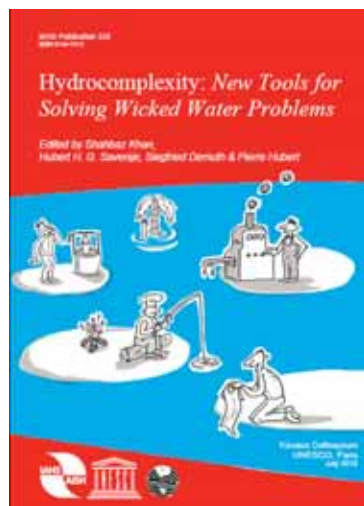
**IAHS at the IUGG2011 Assembly in Melbourne**  
[www.IUGG2011.com](http://www.IUGG2011.com)

A summary of the events that IAHS is organizing is given on page .  
Abstract deadline, 8 November 2010 for events with pre-published Red Books  
Deadline for all other events, 17 January 2011. Submit abstracts via the website.

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### Kovacs 2010 – see page



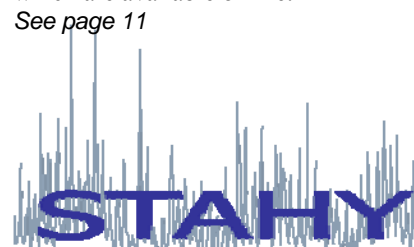
### 2010 Tison Award goes to French authors

The programme for the 10th Kovacs Colloquium, held at UNESCO in Paris, in July, included the presentation of the Tison Award to the winners for 2010. The award is shared by Audrey Valéry, Vazken Andréassian & Charles Perrin for their paper *Inverting the hydrological cycle: when streamflow measurements help assess altitudinal precipitation gradients in mountain areas*, published in an IAHS Red book (Publ. no. 333) in 2009.

The citation and authors' response are published on page

### Advances in Statistical Hydrology

The IAHS STAHY Working Group ran a session at the EGU (European Geophysical Union) assembly at the beginning of May, and then a successful international workshop on statistical methods at Taormina in Italy, the proceedings of which are available online.  
See page 11



## Message from the President *from Gordon Young* [gordonyoung\\_wwap@yahoo.com](mailto:gordonyoung_wwap@yahoo.com)

Assemblies, Symposia, Colloquia and Workshops are the major activities of the Association in bringing scientists together for exchange of knowledge and promoting long-lasting collegial interactions. It is very apparent when a meeting is successful – there is a sense of excitement which pervades the audience – and we must build on successes to ensure that all our meetings stimulate our membership.

The recent Kovacs Colloquium on *Hydrocomplexity: New Tools for Solving Wicked Water Problems*, held in Paris on 2–3 July was a particularly outstanding success. Our UNESCO colleague, Shahbaz Kahn, was the real driving force behind this success – he worked extremely efficiently and effectively to put together a dozen excellent invited papers and some 50 poster papers, published, equally efficiently by our IAHS Press in Red Book 338. In line with our policy of placing greater emphasis on poster papers, extended abstracts of these papers were included in the proceedings; this was a strong encouragement for additional participation in the Colloquium.

Looking ahead there will be a number of major IAHS events in the near future including *HydroPredict 2010* in Prague, *Remote Sensing and Hydrology* in Jackson Hole in September and the FRIEND conference in Fez in October –

see p. ?? or [www.iahs.info/conf\\_frm.htm](http://www.iahs.info/conf_frm.htm) for further information. In the years ahead we have a busy schedule including the IUGG Assembly in Melbourne in 2011, a celebration of the 90th birthday of IAHS in 2012, and a joint scientific Assembly with IAPSO and IASPEI in Göteborg, Sweden in 2013. It is essential for the success of all these events that members plan ahead to include them in their schedules.

The quadrennial IUGG Assembly is the biggest event in the IAHS calendar – details at [www.iugg2011.com](http://www.iugg2011.com) – at which there will be some six IAHS symposia (two joint with other Associations) and some 18 IAHS Workshops (four joint with other Associations). Details of submission deadlines are given on p.?? Within the Symposia there will be a special effort made to treat poster papers and orally presented papers as equal in value.

The IUGG Assembly is also the time when elections for all IAHS officers and officers of Commissions are made. IAHS National Representatives (and members of the IAHS Bureau) have an opportunity and a duty to make nominations for officers. It should be noted that an individual may be nominated for more than one post (except for a nomination for President of the Association) – but may be appointed to only one post. Also, National Representatives may nominate

individuals outside of their own countries. All nominations must be sent to the IAHS Secretary General by the strict deadline of 31 December 2010 ([pjy.hubert@free.fr](mailto:pjy.hubert@free.fr)).

2012 will be a very interesting year in the water world. In March there will be the 6th World Water Forum to be held in Marseille; in the summer there will be the major United Nations event of Rio+20 to be held in Brazil (20 years on from the United Nations Conference on Environment and Development held in Rio de Janeiro); and there will be the 90th birthday celebrations of IAHS – we are looking for a country to host a major IAHS conference, possibly in June 2012 – your suggestions would be appreciated!

In 2013 it has already been agreed that IAHS, IAPSO and IASPEI will hold a joint Assembly in Göteborg, Sweden from 22–26 July. The linkage with IAPSO will provide a major opportunity to have symposia and workshops on land–sea interactions in deltas, estuaries and in the entire near-shore margins in which so many large coastal cities are located.

In between these major events will be many stand-alone IAHS symposia; the agenda is very full and all members are invited to participate and to provide suggestions to make all these events successful.

### **IAHS Newsletter** © IAHS Press 2010

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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](http://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](mailto:pjy.hubert@free.fr), or to:

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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](mailto:cate@iahs.demon.co.uk)

The next Newsletter will be published in December 2010; copy deadline: 31 October 2010.

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## **IAHS at the World Water Week in Stockholm**

The theme of the World Water Week to be held 5–11 September 2010 in Stockholm is *The Water Quality Challenge - Prevention, Wise Use and Abatement* (see the World Water Week website at <http://www.worldwaterweek.org/about>). The intention is to deepen the understanding of the challenges related to water quality control and engage the water community in pollution abatement strategies. The Programme includes plenary sessions, workshops, seminars and side events, as well as award ceremonies and social events.

For the first time IAHS and its International Commission on Water Quality (ICWQ) are involved in the World Water Week as co-organizers. IAHS is one of the convening organisations (together with UNESCO-IHP, IAH, Swedish IHP and others) of the Seminar

**Water Quality in Capacity Development: Policy Options and Practical Solutions in the National and Transboundary Context**

which will take place on the 9th of September.

A systematic approach to capacity and institutional development around the topic of surface and groundwater quality is an essential precondition for human health. The seminar will start with several short keynote presentations, introducing the UN Articles on transboundary groundwater management, and analysing how water quality

management is channelled into capacity building networks at the regional and national level.

After that, roundtable discussions will be held, where policies and actions to protect national and transboundary aquifers, and which can be integrated into capacity development, will be discussed. The topics for the roundtable group discussions include:

1. Institution building and (ground)water quality,
2. Conducting training around the management of regional and national (ground)water quality, and
3. Capacity development in ground(water) quality and land use planning.

The participants will have an opportunity to express their opinions and provide suggestions, which will be later summarized.

IAHS will also have a display stand at the World Water Week to publicise the numerous IAHS activities and recent publications.

All interested IAHS members are cordially invited to come to beautiful Stockholm and participate in this Seminar, as well as in the many other fascinating events. We hope that this is only the first step, and that IAHS will strengthen its involvement in the World Water Week in future.

*Valentina Krysanova, ICWQ President*



## Report from the International Commission on Water Quality

The theme of the 2010 World Water Week in Stockholm, 5–11 September will be *The Water Quality Challenge – Prevention, Wise Use and Abatement*; see page 3. ICWQ

Vice-president, Lakshmanan Elango, has provided a report of water quality conditions in India, which complements the article in Newsletter 96 regarding water quality in India.

### High Concentration of Some Ions in Groundwater in India

Groundwater is an essential and important resource which is utilized for drinking, irrigation and industrial purposes in many parts of the globe. Usually groundwater is less susceptible to pollution compared to surface water. However, over the past few decades groundwater quality has been under threat due to a number of reasons, such as extensive abstraction, increasing population, changing land uses and, above all, improper disposal of municipal and industrial wastes. Natural factors like weathering of rocks, rock–water interactions and occurrence of ore deposits also contribute to groundwater pollution. Groundwater accounts for more than 80% of the urban and rural water needs in developing countries like India. Due to the lack of adequate facilities and piped drinking water supply systems in these countries, groundwater is directly pumped and used for all domestic needs by the majority of the population. High concentrations of fluoride, nitrate, iron, manganese and heavy metals in groundwater are of concern in India.

Salinity is a major problem in the coastal regions of India and occurs in 14 Indian states, namely, Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu and Uttar, and affects 73 districts and three blocks of Delhi.

Long-term use of groundwater containing high fluoride concentrations for drinking results in widespread symptoms of fluorosis, from mild forms of dental fluorosis to crippling skeletal fluorosis. High concentrations of fluoride in groundwater occur in about 25 countries across the globe causing health problems for an estimated 200 million people. In India about 62 million people are affected by dental and skeletal fluorosis (Andezhath *et al.*, 1999). Dental fluorosis is endemic in 14 states and 150 000 villages in India, with the problem most pronounced in the states of Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Punjab, Rajasthan, Karnataka, Tamil Nadu and Uttar Pradesh (Pillai & Stanley, 2002). The worst-affected states in southern India are Andhra Pradesh, Tamil Nadu and Karnataka. The Central Ground Water Board (CGWB), Government of India, has monitored fluoride and iron in groundwaters of Tamil Nadu (Fig. 1). Fluoride concentrations exceed the permissible limit ( $1.5 \text{ mg l}^{-1}$ ) specified by the Bureau of Indian Standards (BIS, 1992) in many locations. The incidence of high fluoride in Nalgonda district, Andhra Pradesh, was studied by Brindha *et al.* (2010). Figure 2 shows that at several locations the fluoride concentration in groundwater used for drinking purposes exceeds the limit. This is because the rocks of this region are rich in fluoride bearing minerals.

Nitrate is one of the major indicators of anthropogenic pollution of groundwater as geological sources of nitrogen are very rare. All nitrogen-containing matter is ultimately oxidized to nitrate and its occurrence in groundwater may be largely because of inorganic nitrogen fertilizers, septic tanks, poorly located or constructed wells and defective sewerage systems. The consumption of nitrate-rich water is associated with a large number of health problems, such as dizziness, abdominal disorders, vomiting, weakness, palpitations,

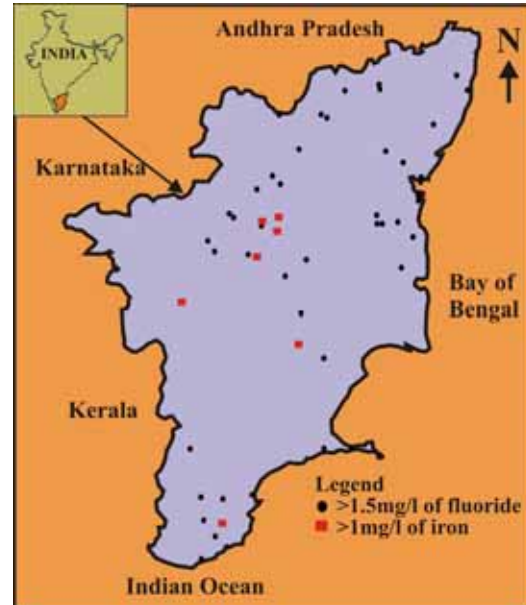


Fig. 1 Locations of high fluoride and iron in groundwater in Tamil Nadu, India.

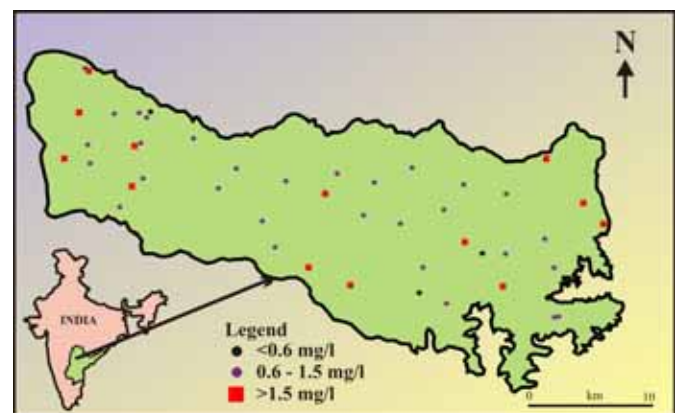


Fig. 2 Average fluoride concentrations in groundwater in a part of Nalgonda district, Andhra Pradesh, India.

mental disorders, methaemoglobinemia (blue baby syndrome) and even stomach cancer. Nitrate pollution in groundwater is more pronounced in the states of Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal. Several studies have been conducted on the removal of nitrate from groundwater which may be accomplished by bacterially-mediated denitrification or by chemical methods such as ion exchange. Use of biodegradable polymers has also proven efficient in nitrate removal from groundwater.

High concentrations of iron and manganese are usually present in anaerobic groundwater and under strongly acidic conditions. Iron concentrations above the permissible limit do not cause a major health risk, but do give water an adverse taste and colour. In the case of manganese, consumption of

groundwater above the WHO guideline value of  $0.5 \text{ mg l}^{-1}$  may result in detrimental health effects. Iron concentrations above the permissible level of  $0.3 \text{ mg l}^{-1}$  are found in 23 districts from four states, namely, Bihar, Rajasthan, Tripura, West Bengal, coastal Orissa and parts of Agartala valley in Tripura. Das *et al.* (2003) reported high concentrations of iron (range  $0.01\text{--}4.23 \text{ mg l}^{-1}$ ) in groundwater from Guwahati, Assam, in alluvial deposits. Smedley (1991) recorded iron concentrations of up to  $37 \text{ mg l}^{-1}$  in groundwaters from Delang Block, Orissa. Confined and semi-confined alluvial and deltaic aquifers of West Bengal possess concentrations of iron and manganese commonly above  $1 \text{ mg l}^{-1}$  (PHED, 1991; CGWB, 1999). In Tamil Nadu, Namakkal and Salem districts are affected by high iron concentrations in groundwater (Fig. 1). Carbon filtration units are used extensively for removal of iron and manganese. Iron reducing bacteria are also employed to eliminate these metals from groundwater.

Heavy metals are found in groundwater as a result of anthropogenic activities. Manufacturing of fertilizers, pesticides, chemicals, chloralkali, pharmaceuticals, coke, cement and explosives, oil refineries, foundries, electroplating industries, coal fields, steel plants, paper mills, tanneries, dyeing units, thermal power plants, aluminium industries and mining activities contribute significantly to concentrations of heavy metals such as mercury, nickel, cadmium, lead, arsenic, zinc, copper, manganese in groundwater. Heavy metal pollution around tanneries in the Chromepet area of Tamil Nadu was assessed and the zone of pollution was identified (Brindha *et al.*, 2009) (Fig. 3).

Since aquifers are threatened by pollution in many parts of India, it is essential to identify the extent of groundwater pollution and develop novel methods for removal of these ions at the household level. This would help to mitigate the problem of pollution of the groundwater which forms the main reliable water source for domestic purposes in developing countries like India and to ensure safe drinking water.

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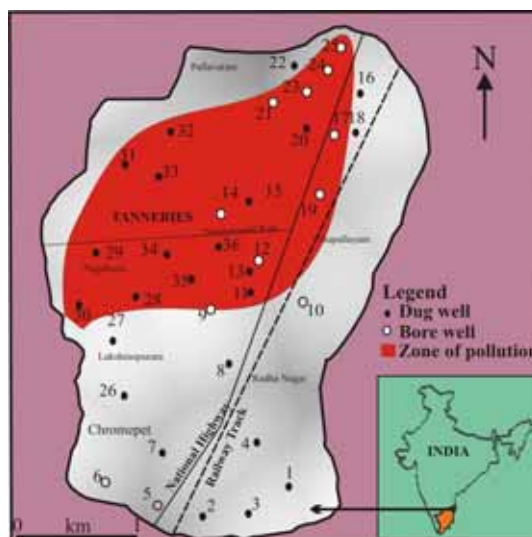


Fig. 3 Zone of heavy metal pollution around tanneries in Tamil Nadu.

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## Report from the International Commission on Groundwater

### Membership

Between 2005 and 2010, the number of IAHS members expressing interest in ICGW increased from 2012 to 2694, i.e. to more than 50% of the IAHS total membership.

### LinkedIn Discussion Group

A new ICGW group has been recently formed using the internet facility LinkedIn. The purpose of the group is to encourage communication amongst ICGW members and with other interested parties in the international groundwater science community, support geographically isolated scientists and junior scientists who have questions about specific technical/scientific problems, and provide a forum for the discussion of relevant (groundwater-related) topics.

The group has 76 members (status on 5 July 2010) and is open to all who have interests in groundwater-related science. A discussion on ground-source heat pump regulations was recently initiated for all interested. It is managed by ICGW Vice-president Corinna Abesser (cabe@bgs.ac.uk), who can be contacted for further information and instructions on how to join. We encourage your participation.

### Conferences

ICGW organizes two long-term conference series (since about 1990), ModelCARE and GQ, and two newer conference series (since 2007), HydroPredict and HydroEco (initiated and organized by Vice-president Karel Kovar), and is active in IAHS Scientific Assemblies and IUGG General Assemblies. ICGW activities in these conferences are summarized below.

### ModelCARE Model Calibration and Reliability Evaluation

ModelCARE focuses on advances in and use of model calibration and reliability evaluations, with special focus on the analysis of groundwater systems. The 2009 conference was the 7th in the series. The conference is now held about every two years, with every other time usually in Europe.

**ModelCARE 2009** The associated Red Book is being prepared by Shemin Ge of the University of Colorado, USA.

**ModelCARE 2011** 18–22 September 2011, Leipzig, Germany. Organizer: Sascha Oswald, University of Potsdam, Website: <http://www.modelcare2011.org>



### GQ Groundwater Quality

GQ conferences are dedicated to improving the science used to measure, analyse, simulate, and manage groundwater quality.

**GQ2007** Organized by Greg Davis and others at CSIRO, Perth, Australia. Red Book no. 324, edited by Mike Trefry, on *Securing Groundwater Quality in Urban and Industrial Environments*, was published in 2008.

**GQ2010** Groundwater Quality Management in a Rapidly Changing World (Zurich Switzerland, 13–18 June 2010). Program available at [http://www.eawag.ch/medien/veranstaltungen/events/gq2010/programme/gq10\\_programm.pdf](http://www.eawag.ch/medien/veranstaltungen/events/gq2010/programme/gq10_programm.pdf)

The GQ10 Committee received over 230 abstracts from 37 countries around the world, and 220 delegates from 28 countries actually participated in the conference. An exciting program of 83 oral and 96 poster presentations was arranged that also allowed extensive discussions among researchers, regulators and industry participants. The conference concluded with an open forum of discussions on “The future issues of groundwater quality research and outreach to society”.

### HydroPredict

International Interdisciplinary conference on Predictions for Hydrology, Ecology and Water Resources Management: Using Data and Models to Benefit Society

**HydroPredict2010** Changes and Hazards caused by Direct Human Interventions and Climate Change. 20–23

September 2010, Prague, Czech Republic. <http://web.natur.cuni.cz/hydropredict2010/index.php>. The conference is being organized by Zbyněk Hrkál, Karel Kovar, (also VP for ICGW), Hans-Peter Nachtnebel, and Svatopluk Matula.

### HydroEco

International Multidisciplinary Conference on Hydrology and Ecology: Ecosystems Interfacing with Groundwater and Surface Water

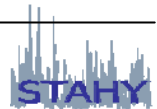
**HydroEco2011** Ecosystems, groundwater and surface water, pressures and options, Vienna, Austria 2–5 May 2011 <http://web.natur.cuni.cz/hydroeco2011>. The conference is organized by Hans-Peter Nachtnebel, Karel Kovar and Zbyněk Hrkál.

### Mentorship Program

We continue the mentorship program at our conferences. For Mentorship lunches the conference SAC members and sometimes others are asked if they will fill out a sheet that conference attendees can use to sign up to have lunch with them. The lunch is usually the second day of the conference. It is a nice, easy way to provide conference attendees an opportunity to talk to the SAC members, and we emphasize getting students involved.

Chunmiao Zheng, ICGW President  
Roger Lee, Secretary

## STAHY Workshop: Advances in Statistical Hydrology



The 23–25 May workshop at Taormina, Italy, was attended by 80 people from 24 countries. Two really interesting invited lectures were given by Prof. Vijay Singh and Prof. Jose D. Salas, on entropy theory and long memory linear modelling, respectively. And, particularly interesting was the round table, managed by Prof. G. Rossi, in memory of Prof. V. Yevjevich. The following colleagues gave contributions either about the extraordinary life and/or about the research activity of this father of hydrology: Tina Dasic, Jovan Despotovic & Jasna Plavsic (University of Belgrade, Serbia), Jose D. Salas (Colorado State University, USA), Vijay P. Singh, (Texas A & M University, India), Francisco Gomide (Universidade Federal do Paraná, Brazil), Geoff Pegram (University of KwaZulu-Natal, South Africa) and Giuseppe Rossi, Università degli Studi di Catania, Italy. All the participants delivered good presentations followed by a rich discussion.

After the oral sessions, a discussion was stimulated with the aim to identify future topics to potentially include in the STAHY initiatives. Among others it was clear that it could be

useful to include time series analysis, long range dependence, linear and nonlinear modelling, uncertainty analysis, and regionalization procedures in the next initiatives:

Following the usual STAHY style, all the poster and oral presentation files are posted at the STAHY website, and videos of each presentation will be soon available. An initiative to stimulate the poster session was tried as an experiment: more than 20 interviews with the authors were video recorded (3–5 minutes each) and will also be posted on the website: [www.stahy.org](http://www.stahy.org)

A special thanks to the University of Catania, Department of Civil and Environmental Engineering for the wonderful organization and warm hospitality, in particular to: Antonino Cancelliere, Giuseppe Rossi, David J. Peres, Antonio Castano, Sandra Lazzarini, Leila Castiglione, Brunella Bonaccorso and Vincenzo Nicolosi.

Below: the Taormina workshop participants.



## An Australian view of the Kovacs Colloquium

*Bonjour!* I'm here to share my experiences at the 10th Kovacs Colloquium held in Paris 2–3 July. Over two full days we heard talks and participated in the discussion on the topic of *Hydrocomplexity: New Tools for Solving Wicked Water Problems*. I benefited enormously from the research and experiences of other scientists as well as water managers. The main message I received was that to overcome the “wicked” problems, which are also changing with time, more data need to be collected, more importance should be placed on integrating surface and groundwater, and that more participation from stakeholders and community are required. I also enjoyed the interaction with other young researchers, experienced scholars, water resource managers, as well as those involved in promoting education about water management in different countries.

This was the first time I attended an event organised by UNESCO and IAHS. It is a wonder, and regrettable, really, that in the last six years as an active researcher in the field of water resource management I have not been involved with this great network of people. I met brilliant people and made wonderful friends, which not only made the experience enjoyable, but also helped build a network that is so important in water management nowadays.

It was also the first time opportunities were given to participants to present a poster of their research work. This was actually one of the main reasons I decided to attend the Colloquium, as presenting my work was important for me. The poster sessions also facilitated valuable learning from the research of the participants. My suggestions are for the poster presentations to be continued in future colloquiums, and that the event be promoted and publicised more and to a wider audience, such that more researchers can benefit from the interactions and the knowledge shared.

On a personal note, not only did I learn a great deal within the multi-national and multi-cultural context of the colloquium, which worked so well, I was also exposed daily to the rich French culture. I learnt a little Français (this is a survival skill), tasted French croissant, foie gras, and tartare de boeuf, and enjoyed an exciting stroll along the famous Avenue des Champs-Élysées.

For the *formidable* experience, *merci beaucoup!* And hopefully, *à bientôt*, at the next IAHS or UNESCO event!

Ria Kristiana, Centre for Water Research  
University of Western Australia, Perth, Western Australia



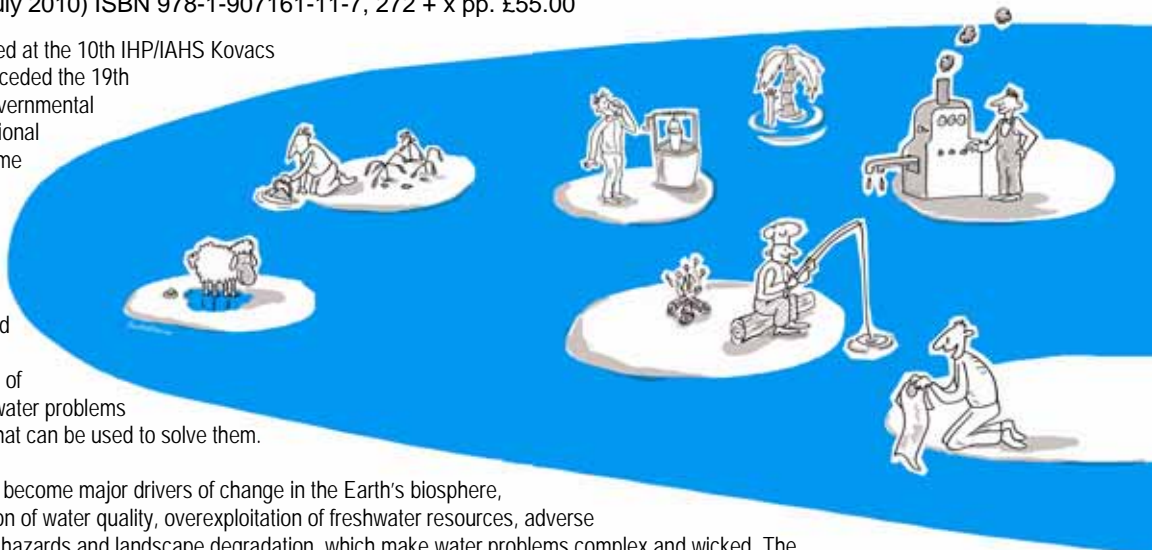
From left to right, Moloko J. Matlala, Director Information Programmes, Dept of Water Affairs and Forestry, South Africa, Lerato C. Bapela, Hydrological Resource Analyst, Dept of Water Affairs, South Africa, with Ria Kristiana.

## Hydrocomplexity: New Tools for Solving Wicked Water Problems

Edited by Shahbaz Khan, Hubert Savenije, Siegfried Demuth & Pierre Hubert

IAHS Publ. 338 (July 2010) ISBN 978-1-907161-11-7, 272 + x pp. £55.00

This book was launched at the 10th IHP/IAHS Kovacs Colloquium, which preceded the 19th Session of the Intergovernmental Council of the International Hydrological Programme of UNESCO, and was held at UNESCO, Paris, 2–3 July 2010. It contains keynote papers by the invited speakers and extended abstracts of posters, focusing on the issues of complexity of wicked water problems and the type of tools that can be used to solve them.



Human activities have become major drivers of change in the Earth's biosphere, resulting in deterioration of water quality, overexploitation of freshwater resources, adverse effects of hydrological hazards and landscape degradation, which make water problems complex and wicked. The same activities also affect the functioning of ecosystems and their ability to provide goods and services on which human well-being depends. There is a need for community-based transdisciplinary management tools to provide a better understanding of water as both an abiotic resource and as a service delivered by ecosystems.

## The 2010 International Hydrology Prize

### Citation by Gordon Young, IAHS President

I have great pleasure in presenting Professor Murugesu Sivapalan of the University of Illinois as this year's recipient of the International Hydrology Prize. Professor Sivapalan is eminently worthy of this award for truly outstanding contributions to the science of hydrology, having shaped modern hydrology in a most distinctive way. He has been a key player in formulating a new hydrological theory at the watershed scale and has contributed immensely to a wider inter-disciplinary view of hydrology as an Earth Science. His publication output is exceptional (135 articles in ISI with an H-index of 32), but it is not only this productivity that has elevated his profile. More important are the new concepts he has introduced. It is by these that he has imprinted his vision on the shape of modern scientific hydrology, making a permanent impact.

Murugesu Sivapalan was born in Sri Lanka in 1953 where he obtained his BSc degree in Civil Engineering at the University of Ceylon, Peradeniya, in 1975. He completed his MEng degree at the Asian Institute of Technology in Bangkok in 1977, and after working as a consultant for some years in Nigeria enrolled at Princeton University where he obtained MA and PhD degrees in Civil Engineering in 1983 and 1986, respectively. His subsequent academic career can be divided into three distinct periods. The first nine years (1987–1995) were devoted to fundamental research on scale problems in hydrological modelling. His early contributions mark the introduction of similarity concepts in flood hydrology, a concept that had been well established in fluid dynamics but hardly known in hydrology. In a series of papers entitled "*On hydrologic similarity*" he brilliantly conceptualised the effects of hydrological heterogeneity and scale, and their effects on runoff response. This ultimately led to the notion of the Representative Elementary Area (REA) which was presented as a building-block scale for the development of distributed watershed models. With these new ideas Dr Sivapalan was well ahead of the conceptual thinking of his peers. We all remember the excitement they transmitted at the time, a natural result of the originality of his ideas and reflecting a truly exceptional mind that always tries to explore new pathways to learning.

Continuing his thoughtful and groundbreaking work further Dr Sivapalan later introduced the meta-channel concept as a clever way of representing the hydraulics of flows in a complex river network by a one-dimensional effective channel, called the meta-channel, thereby bridging the gap between conceptual hydrological models and physically-based fluid dynamics models. His subsequent work on derived flood frequency was similarly groundbreaking as it introduced, for the first time, the concept of hydrological regimes in a flood frequency context, which allowed him to demonstrate the connection between the spatial scaling behaviour of flood frequency and interactions between climatic and watershed time scales.

In the second period of his career (1995–2003), on the basis of deep insights gained from his previous theoretical studies, Dr Sivapalan focused on novel approaches to the development of a new generation of models at the watershed scale. His contributions to watershed thermodynamics have been considered by many peers as a quantum leap in the area of watershed hydrological modelling. First averaging the

balance equations for mass, momentum, energy and entropy over a Representative Elementary Watershed (REW) that was defined in a way that is consistent with watershed scale processes, he and his students and collaborators derived constitutive relations to go along with the balance equations at the REW scale, on the basis of the second law of thermodynamics. Based on the now determinate set of balance equations he proposed a new paradigm for the development of distributed watershed models (at the REW scale) that promise to be more versatile and less dependent on calibration than current models. He and his students and several colleagues together have now completed the development and implementation of a new and comprehensive watershed model known as CREW, which included the development of new closure relations to account for the effects of sub-REW-scale process heterogeneity. However, not satisfied with this upward approach to modelling, Dr Sivapalan also introduced a new and parallel data analysis framework that exploits simple signatures of watershed responses including event-scale, seasonal and annual characteristics to generate understanding of watershed functioning from observed rainfall–runoff data. In this way he advanced an alternative top-down or downward approach to the development of parsimonious and physically-based models of appropriate complexity and fidelity to counterbalance complex models based on fundamental process theories alone, as is the case with models based on the REW approach. The outputs of both of these two lines of research, in the form of over 20 journal articles, have had a significant influence on the watershed modelling community, and have been highly cited in the short time since they were published.

Around 1999, Dr Sivapalan turned his attention to an even more challenging topic, namely the problem of *predictions in ungauged basins* (PUB). Indeed, many of the thoughtful new concepts he had introduced or explored in his previous research provided him the perfect launch pad to attack this fundamental and as yet unsolved problem in hydrology. When in 2000–2001 IAHS decided to launch a new decadal initiative and was searching for new ideas it was Dr Sivapalan's suggestion of PUB that caught the attention of the IAHS and found favour amongst the global hydrological community. When the IAHS Decade on PUB was eventually launched in 2002 as a global initiative, he was the most obvious choice for its leadership, given the strength of his ideas and prior contributions to the field. By taking up its leadership, Dr Sivapalan not only helped organize and energize the global hydrological community around PUB, but through writing the PUB Science Plan, helped develop a firm theoretical foundation for watershed hydrology. He almost single-handedly masterminded running the PUB initiative in its formative years and made it into one of the flagships of IAHS. The influence of PUB that he initiated and led has spread far and wide, with the PUB science and implementation plans impacting on many new community initiatives that have been started or are being planned in several countries. By the time he stepped down from his PUB leadership in 2005 Dr Sivapalan had become one of the giants in scientific hydrology, a name that immediately rings a bell in the hydrological community anywhere in the world.



In the latest phase of his career (2004–2010), Dr Sivapalan's research has evolved further to address the general and even broader problem of *predictability*, going beyond the narrow confines of hydrology and embracing geosciences at large. Realizing that improving predictability required a broadening of the foundations of hydrological science to cope with the inability to observe and deal with subsurface heterogeneity, he has now embarked on a new thrust towards inter-disciplinary research. Drawing from a seemingly inexhaustible supply of new ideas, Dr Sivapalan has continued to carry out fundamental research, this time on the role of threshold nonlinearities in watershed systems and subsystems, and their impact on predictability. Not only did it allow him to represent transport problems of, say, pesticide in a more parsimonious way, but it also provided a most natural way for expressing the limits of hydrological predictability in diverse hydrological contexts, including that of flood frequency. Recognizing the considerable uncertainty in hydrological predictions due to the inability to estimate transpiration by natural vegetation realistically, he successfully tested the principle of vegetation optimality, that of maximization of net carbon profit, an exciting new approach that holds enormous promise for improved predictive understanding of a variety of other hydrological processes at the watershed scale and, indeed, at the global scale. This work is currently ongoing in a new community project led by Dr Sivapalan, which is aimed at improving predictability of water cycle dynamics through inter-disciplinary synthesis. The threads of a coherent new research framework proposed by Dr Sivapalan based on inter-disciplinary synthesis are already clear and the products of this research are reflected in over 45 papers published in the past five years alone, influencing the community in a substantial manner.

Dr Sivapalan has been widely recognized for these contributions throughout his career. In 2001 he became a Fellow of the Australian Academy of Technological Sciences and Engineering. In 2003 he won triple honours: Fellow of the American Geophysical Union, the John Dalton Medal of the European Geophysical Society, and the Australian Government's Centenary Medal. In 2007 he was made the Borland Lecturer by AGU Hydrology Days at Colorado State University. He is an Editor, or Associate Editor, of eight of the most prestigious journals in the field. The esteem in which he is held by peers is reflected by his name having been turned into a brand identity – a name that stands for thoughtful new contributions that have distinctly helped shape the science of hydrology.

Professor Sivapalan is one of the greatest hydrologists of our time. Important in view of IAHS's global mandate, he is one of the top hydrologists in the world who was born and educated in a real developing country: Sri Lanka. He has played a key role in defining the research agenda of IAHS in the coming years through his formulation and implementation of the PUB Science Plan. He is one of the most innovative thinkers, always approachable for young scientists, and is a role model for the new generation of hydrologists, world-wide. It is a great honour to present the International Hydrology Prize to Professor Sivapalan on the basis of these truly outstanding contributions to watershed hydrology and his global leadership in advancing the problem of predictions in ungauged basins. He adds distinction to a very distinguished award.



Murugesu Sivapalan

### **Response by Murugesu Sivapalan**

Gordon, I am truly humbled by the honour and recognition that IAHS has bestowed on me through this prestigious award, and I am delighted to be receiving it in the presence of friends and family.

Your citation made a lot of flattering statements about my contributions to international hydrology. I am reminded that exaggerations are par for the course when it comes to award citations. Instead of making a vain attempt to refute them, I want to use this time to talk about IAHS, and especially about the IAHS Predictions in Ungauged Basins (or PUB) initiative. I have done a lot of different things in my career but the work that brought me into IAHS was really the PUB initiative. Through adopting my suggestion of PUB and handing me its early leadership, IAHS had offered me a platform to push forward with some of my ideas. There is self-interest in the common interest, after all. As much as PUB is the "jewel in the crown" of the IAHS, it has also been a great vehicle to advance my own scientific career, for which I am grateful.

Long before the IAHS PUB initiative was launched, PUB had played a major role in revitalizing my research career. Round about 1997 I was feeling disillusioned, in spite of the fact that my productivity was at its peak. I did not see the relevance of my work to societal problems that affected real people, and felt a growing emptiness. It was at this time that Professor Vijay Gupta was visiting on sabbatical, and introduced to me the idea of PUB. For the first time I began to see how I could relate many of the things I was doing to the general problem of PUB, and this helped to re-energize my research. Thereafter I reoriented my research and channelled it towards developing a research vision centred on PUB. When I eventually became full professor and gave my inaugural lecture in July 2000, the subject matter was indeed PUB. The elephant logo, which was subsequently adopted by the IAHS for PUB, had already showed up in my inaugural lecture.

In December 2000 I started a six-month sabbatical stay at Delft, and travelled to Europe via Chennai and Bangalore in India. Between December 2000 and June 2001, during my frequent travels across Australia, India and Europe (Perth, Chennai, Bangalore, Barcelona, Lancaster, Newcastle, Stuttgart, Delft IHE and Delft Hydraulics, Bristol, Bari, and Paris), I repeated my inaugural lecture a dozen times, almost unchanged, with what can only be described as a missionary zeal, picking up new ideas through my exchanges with leading scientists I met along the way. It was during the same period, during Kuni Takeuchi's first year of IAHS Presidency and while I was still in Europe, that IAHS was going through

considerable soul-searching about its role in international hydrology, through the medium of an e-mail discussion that Kuni had set up in preparation for the IAHS Congress in Maastricht. It is not surprising that my ideas on PUB were well honed by then, and I was able to argue cogently and passionately for PUB. What is surprising and gratifying, however, is that my ideas were received so enthusiastically and adopted so quickly, and in the end I was the one called upon to lead PUB. This went beyond my wildest expectations. Clearly PUB and the ideas behind it had struck a chord.

One has to acknowledge in passing that, understandably, there was some resistance to the idea of IAHS spearheading such a decadal scientific initiative. Even after PUB was adopted there were still differences of opinion about exactly what PUB should focus on. It is to the eternal credit of the officers of IAHS, and one man in particular, former President Kuniyoshi Takeuchi, that PUB took off, gathered steam and found acceptance along the way. Professor Takeuchi deserves as much credit as myself, if not more, for PUB being where it is, and in an indirect way, for me winning this prize. I am truly grateful to Kuni Takeuchi, Pierre Hubert and other officers of the IAHS for their support and understanding, and especially for giving me the autonomy I felt I needed to lead PUB as a global grassroots movement.

The success of PUB is an object lesson about the power of a simple idea, and how, when supported by clarity of vision and targeted action, it can unleash people's excitement and mobilize their self-interest towards a common interest, and how these can lead to great achievements. The universality of the PUB idea and the adoption of the grassroots emphasis were crucial to maintaining a level playing field and encouraging wider participation, which I attribute as the chief reasons for the success of PUB. They have helped PUB become a role model for how community initiatives should be organized, for which IAHS can be justifiably proud. I hope that IAHS will continue to play a leadership role in international hydrology, building on the example and successes of PUB.

I want to acknowledge a number of other individuals who have helped advance the interests of PUB over the past 10 years. I want to highlight the part played by Enda O'Connell, Stewart Franks, Daniel Schertzer and John Schaake who helped, at crucial times, to develop and perfect the PUB science and implementation plans. I want to thank my successors as PUB Chair, namely, Jeff McDonnell, Günter Blöschl and John Pomeroy, for keeping the spirit of PUB alive and moving it steadily forward from where I left off. I am convinced that the PUB Benchmark Report that

Günter Blöschl is putting together will become a major milestone in global hydrology, and I am eagerly awaiting its publication in a year's time.

The five years working on PUB has connected me to an enormous number of people worldwide, and I have been enriched in ways academic, personal and cultural. The friendships made along the way are the greatest single legacy of PUB for me personally. I owe a special debt of gratitude to all members of the PUB family worldwide for their contributions to the adoption and growth of PUB.

I share this award with so many people – students, teachers, colleagues, friends and family, too numerous to mention by name. I now want to name and thank a few special people in my life. I want to thank Hubert Savenije and Günter Blöschl for being great friends, colleagues and critics. My friendship with them is forever. I also want to thank my wife Banumathy, sons Mayuran and Kavin, and daughter-in-law Lizanne, for being the bedrock of love and support over the past many years. The most useful thing they do for me is to, from time to time, bring me down to earth by demanding that I be a better husband and father, although I will readily admit that I have not yet been able to reach the high standards they have set for me. In spite of this, their love and support is unwavering.

My father, if he was here today, would bask in the glory of the great deeds he must have done in his lifetime to have a son so honoured by this august assembly of learned people. My mother, if she was here today, would beam with delight at the praises for my achievements even more so than when she first held me in her arms. For once she would forget the pain that she must have endured to bring me into this world and the enormous hardships I know she endured to raise me to the position I am in today. I feel sad that my parents are not physically here to witness the moment they richly deserved, and had waited for all their lives, but I am sure they are looking down from Heaven, and I can feel their eternal blessings.

Before I conclude, I want to pay a tribute to Vit Klemeš, former President of IAHS, and former winner of the International Hydrology Prize, who passed away last March. Vit was a hero to me, and I have been heavily influenced by his writings over the years. I was so fortunate to have had the opportunity to visit him at his home in Victoria, British Columbia, Canada, last summer, and to be at the receiving end of his generous hospitality.

In closing, Gordon, I want to thank you for your citation and thank IAHS, WMO and UNESCO for honouring me with this award. Thank you all for being here for me. This day will remain one of the happiest days of my life.

## Hydrological Sciences Journal

The fifth of the eight issues in volume 55 of *Hydrological Sciences Journal* is already published and available on the InformaWorld platform. Everyone may read the editorial and abstracts in this issue at: [www.tandf.co.uk/journals/thsj](http://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 online access to the journal for IAHS members in the poorest countries is arranged. Eligible members should go to the Membership Area at the IAHS website, enter their personal userid and password, then click on HSHLink.

The next issue of HSJ will be a Special Issue: *Court of Miracles of Hydrology*, guest edited by Charles Perrin, Vazken Andréassian, Eric Parent and Andras Bárdossy.



## The 2010 Tison Award



Gordon Young with the Tison Award winners: Charles Perrin, Audrey Valéry and Vazken Andréassian, and Zbigniew Kundzewicz at UNESCO, Paris, 2 July 2010.

### **Citation by Z. W. Kundzewicz, IAHS Editor and Chair of the Jury of the 2010 Tison Award**

The Jury of the 2010 Tison Award recommended bestowing the 2010 Tison Award upon three young French hydrologists: Audrey Valéry, Vazken Andréassian & Charles Perrin from the Cemagref Hydrosystems and Bioprocesses Research Unit, based in Antony, France. The winning paper: *Inverting the hydrological cycle: when streamflow measurements help assess altitudinal precipitation gradients in mountain areas* was published in the IAHS Publication no. 333 in 2009. All three authors meet the age requirement of the Tison Award (under 41 at the moment of publication of the awarded paper) and share the Award.

The awarded paper implements a challenging idea for solving an inverse problem in hydrology, i.e. reconstructing the input signal from analysis of the output signal. The authors attempt to “invert” the hydrological cycle and to draw corollaries on precipitation in data-sparse mountainous regions by using streamflow observations. The inverse problem, known in applied mathematics and theoretical hydrology, is regarded as very difficult (ill-posed) in general, yet the authors deal with an even more difficult special case of determining precipitation in mountainous areas, where the observations are sparse and of inadequate quality. The authors attempt to offer an informed guess on the quantity of precipitation falling at higher elevations where no observations are made. The authors used data sets from Swiss and Swedish catchments, and three simple long-term water balance formulas (proposed by Budyko, Ol'dekop and Turc-Le Moine). By assuming a simple two-parameter correcting model to regionalize precipitation from a sparse precipitation gauging network, the authors show that it is possible to identify the precipitation–elevation relationship from streamflow, while the snow undercatch parameter remains more difficult to identify.

I am very glad to inform you that the awarded paper is just an entrée for a new, substantial contribution by the authors. They contributed to a forthcoming special issue [55(6)] of *Hydrological Sciences Journal*. There is another interesting paper in this special issue, jointly authored by all three Tison 2010 laureates. Moreover, Dr Andréassian and Dr Perrin have, in fact, done considerable work, standing

behind this whole, very interesting, special issue entitled *Court of Miracles of Hydrology*. The principal message conveyed by this special issue is that a thoughtful analysis of failure stories can indeed contribute to the advancement of hydrological sciences.

Finally, let me end with a personal reflection. Twenty-three years ago, in 1987, in Vancouver (British Columbia, Canada), the Tison Award distinguishing the best paper in IAHS publications by a young author, was given for the first time. I am proud to say that I was the first laureate. This Prize, whose monetary value is only symbolic, has had a considerable impact on my scientific career.

Ladies and Gentlemen, I feel honoured and pleased to bestow the 2010 Tison Award to Audrey Valéry, Vazken Andréassian & Charles Perrin. Let me wish that this Prize marks an important milestone in their scientific careers.

### **Response to Prof. Kundzewicz's Citation by Vazken Andréassian**

Dear Prof. Kundzewicz, receiving the Tison Award from your hands is indeed a great honour for us three. We are extremely proud to see our names added to the list of great hydrologists who previously received this award. We must confess that when IAHS Secretary General Pierre Hubert called us to announce it, it was a real surprise. Even if the French are not best known worldwide for being modest, the question that immediately came to us was: *do we really deserve it?*

Do we really deserve it? This is a difficult question. We can think of many talented young colleagues that in our eyes would equally deserve it. If sadly-missed former IAHS President Vit Klemeš was still with us, he would have found an answer. He would probably have asked radio Yerevan about it, as he did in his 1988 paper entitled, *A hydrological perspective*. This would probably have yielded something like:

Question to radio Yerevan: *Do these three French scientists deserve the Tison award for young deserving hydrologists?*

And the answer would probably have been:

*In principle yes, but ...*



- *they are not deserving, they are lumped modellers and their models are full of “fudge factors”*,
- *and they are not young, two of them already have some grey hairs (that they did not even try to die for this ceremony)*,
- *and it is doubtful that they are actual hydrologists, since they hardly drink any water.*

Now that this essential question has been solved, and that most of the time we had been allocated for answering has been spent, please allow us to go straight to the important things. An award-giving ceremony is the occasion to thank all those who have helped us on our way, because as Isaac Newton said, “If we have seen further, it is only by standing on the shoulders of giants”.

The first of these giants is somebody few of you have heard of, and that very few of you have ever seen. His name is Claude Michel, a retired Cemagref hydrologist. Perhaps Prof. Kundzewicz still remembers him as a regular reviewer of papers for the IAHS journal. His humility was sometimes excessive, fed by many years of hydrological practice, but it was extremely instructive for us. He taught us Hydrology; we owe him our concern for parsimony, and the requirement that any new model change should be tested on a few hundreds of catchments before being seriously considered. He was deeply respectful of younger people: he was always trying to convince us that the solution he had proposed was in fact our own idea.

Working with such a man leaves its marks on young people, and most of the PhD students who have worked with him, and later with us, were irremediably marked by this experience. We definitely keep extremely strong links with each other. We even arrange to spend weekends together, notably to celebrate the so-called NASH (Nouvelle Année Socialement Hydrologique) under the responsibility of an “international social hydrology club”. To mention but a few, we want to cite in particular Thibault Mathevet, Ludovic Oudin, Marie Bourqui, Nicolas le Moine, Julien Lerat, Lionel Berthet and Jean-Luc Payan outside Cemagref, and Cécile Loumagne, Helena Ramos, Marine Riffard and Mamoutou Tangara in our research group. This award belongs collectively to all of them.

We also wish to thank all our colleagues from other institutes in France and in many parts of the world, for collaborations over the past years, for lively debates and passionate discussions about hydrological science ... which we sometimes continued on frisbee fields!

Then we would like to cite the names of colleagues which honour us today by their presence: Prof. Ghislain de Marsily of the French Academy of Sciences, Jean Margat, Dr Claude Cosandey, Roger Genet (Director General, of Cemagref), Pierrick Givone (Director for Strategy, Cemagref) and Etienne Frossard (Technical Director of Coyne et Bellier).

Our thoughts go also to our families (spouses, partners, children and parents) to thank them for their unfailing support on our hydrological pathways.

Last but not least, we would like to thank the Tison Award committee, Secretary General Pierre Hubert and President Gordon Young, Professors Kundzewicz and Koutsoyiannis, as well as Cate Gardner and Frances Watkins.

We would like to dedicate our last words to Prof. Léon Tison, after which this award has been named. We are definitely too young to have known Prof. Tison, but we talked a couple of days ago with our retired colleague Jean Margat who knew Prof. Tison personally. He had first met Prof. Tison fifty years ago, when receiving financial support from IAHS to travel to a conference in Athens. He remembers him as a distinguished person, who extracted from his pocket a load of green dollars to give him the financial support awarded by IAHS. For young hydrologists wishing to travel to international conferences and to build their own research group, let us recognize that green is, after blue, the second favorite colour.

The Tison Award paper is freely available as a pdf at: [http://iahs.info/redbooks/a333/IAHS\\_333\\_0281.pdf](http://iahs.info/redbooks/a333/IAHS_333_0281.pdf) and the Red Book in which it is published is:

*New Approaches to Hydrological Prediction in Data-sparse Regions* (ed. by K. K. Yilmaz, I. Yucel, H. V. Gupta, T. Wagener, D. Yang, H. H. G. Savenije, C. Neale, H. Kunstmann & J. Pomeroy) (2009) IAHS Publication 333. The table of contents and abstracts are available at: <http://iahs.info/redbooks/333.htm>

## **IAHS and National Hydrological Associations – We need your help**

When IAHS was established back in 1922, there were very few, if any, National Hydrological Associations (NHAs). However, things have changed markedly in this regard in recent times and there are now many NHAs which promote the science and practice of hydrology at national level, working with individual hydrologists and, as appropriate with other national organizations and agencies.

Within the past few years, it has become clear that much could be gained by all concerned if these NHAs were to be in contact with each other and with IAHS and so, following a decision taken by the IAHS Bureau in July 2007, we have been developing plans as to how we might establish a loose but effective network of NHAs. In this we are keen to involve the NHAs themselves. The project is aimed at serving them and so they should have a major say in how it is implemented. Therefore, before any definite plans are set, we need to make contact with as many of the Associations as possible so as to seek their advice.

It is important to stress that IAHS has no mandate or intention to impose anything on the NHAs. We will not require anything of them and will not interfere in their work in any way, including their established co-operative arrangements with other national or international bodies. We will simply offer them a facility for networking with fellow Associations in other countries and with IAHS.

Under the “Links” section of the IAHS web site (<http://iahs.info>) you can find the list of NHAs that we have compiled so far. We are appealing to all IAHS members to provide us with the names, web sites and contact addresses of any additional NHAs of which they are aware. Please send your inputs to me at:

[arthuraskew@greenmail.ch](mailto:arthuraskew@greenmail.ch)  
with a copy to Pierre Hubert at  
[pjy.hubert@free.fr](mailto:pjy.hubert@free.fr)

*Arthur Askew, Past-president*

# HydroEco 2011



3rd International Multidisciplinary Conference on Hydrology and Ecology — Vienna, Austria, 2–5 May 2011

## Ecosystems, Groundwater and Surface Water – Pressures and Options

For information and abstract submission go to: <http://web.natur.cuni.cz/hydroeco2011/>

### Planned conference sessions:

- Session A: Interactions between surface water, hyporheic zone, saturated and unsaturated groundwater
- Session B: Connections between ecology and groundwater recharge and evapotranspiration
- Session C: Plant-groundwater interactions
- Session D: Links between hydrology and biogeochemistry in groundwater
- Session E: Modelling surface-water-groundwater systems
- Session F: Modelling interactions between hydrology and ecology
- Session G: Management, legal and regulatory issues
- Session H: Bio-indicators of groundwater and surface water quality
- Session I: Land use implications (including restoration and ecohydrology)
- Session K: Global change (human activity, natural changes): from noises to trends
- Session S: Landscape versus local controls on water quality in small streams

Many ecological systems owe their existence to physical/chemical properties of groundwater and surface water, and can be damaged if water flow or water properties are changed by anthropogenic or natural processes. To address the resulting issues, this conference brings together engineers and researchers from engineering and ecological disciplines. The disciplines include, but are not limited to, hydrology, ecology, environmental engineering, biology, chemistry, geochemistry, environmental biogeochemistry, and subsurface microbiology. The unifying theme is the interaction between groundwater and (or) /surface water and ecological systems. A typical example is the hyporheic zone in riparian areas, where the ecological system interacts with water and chemical flows between surface and groundwater.

### Abstracts are due by 14 September 2010

For more information contact: Prof. Hans-Peter Nachtnebel, Universität für Bodenkultur Wien (BOKU), University of Natural Resources and Applied Life Sciences, Vienna, Austria, [hans\\_peter.nachtnebel@boku.ac.at](mailto:hans_peter.nachtnebel@boku.ac.at); or Karel Kovar, Netherlands Environmental Assessment Agency (PBL), [karel.kovar@pbl.nl](mailto:karel.kovar@pbl.nl)

## Status and Perspectives of Hydrology in Small Basins



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Only in well-defined small basins with high-quality measurements can the complexities of combined physical, chemical and biological processes be adequately investigated. Small hydrological research basins provide interdisciplinary observatories, thus contributing to the study of the impact of environmental changes and to developing strategies for water and land-use management under such change. This volume, the Proceedings of the Workshop held at Goslar-Hahnenklee, Germany, in spring 2009 focuses on:

- Presently operational small research basins
- Fundamental hydrological research results drawn from small basins
- Hydrological processes
- Importance of small basin data and results for hydrological modelling

and includes the **Braunschweig Declaration** on: *The need for a global network of long-term small hydrological research basins.*

## The Hydrological Atlas of Switzerland

The six latest plates of the Hydrological Atlas of Switzerland (HADES) were presented at a meeting held at the Casinotheater in Winterthur, Switzerland, in March. In addition, two speakers talked about international cooperation, revealing the importance of having reliable basic data for facing today's challenges.

Water is essential for survival as well as representing a potential danger. This has always been the case, and today nothing has changed. At the HADES meeting held in Winterthur in March this year, the focus was on various aspects of water. Discussions centred around the many challenges facing the international community as well as the federal, cantonal and local authorities in Switzerland.

### Sharing information and knowledge

Philippe Crouzet from the European Environment Agency spoke about the Water Information System for Europe (WISE), which is in the throes of being set up. The main aim of WISE is, on the one hand, to contribute towards the use of water resources and, on the other, to ensure that the quality of water ecosystems is maintained.

Arthur Askew, former Director of the Department for Hydrology and Water Resources at the World Meteorological Organisation in Geneva and former President of IAHS, made a convincing plea for cooperation with regard to water at all levels. His talk centred around the importance of sharing not only worldwide water resources but also our knowledge about them. The use of water resources is a cross-border issue but not only a matter that concerns different countries. It is also important on a smaller scale such as in certain regions of individual countries and for cantonal and local authorities.

This led to a look at Switzerland and in particular at the Hydrological Atlas of Switzerland, whose importance is generally recognised according to Willy Geiger, Deputy Director of the Federal Office for the Environment (FOEN). He added that the HADES committee ensured that the Atlas contained high quality material and covered a broad range of aspects of hydrology. The key to its success lies in the collaboration between a broad spectrum of specialists from scientific circles. Thanks to the commitment of the editorial team and the authors, the continuation of the Atlas is ensured, and according to the Deputy Director of the FOEN it can look forward to a successful future.

### Hydrological knowledge in Switzerland

Dominique Bérod, Head of the Service Hydrologie at the FOEN, said that, in future, the emphasis will be on taking advantage of the new possibilities offered by information technology. The classical maps used in the Atlas will continue to be produced, but in the future interactive visualisation platforms that offer users new possibilities and provide the relevant cartographical information in digital form, will be available in addition.

Before the new plates that make up the ninth series for the Atlas were presented, Rolf Weingartner from the Geographical Institute at the University of Berne and head of the HADES project looked back on the early days of the Atlas twenty years ago. The first plates contained general hydrological knowledge and showed the results of the Swiss National Science Foundation's project entitled: *Basic problems of the Swiss water balance* (NFP 2) from the 1980s. NFP 61, *Sustainable use of water*, which was officially started a few weeks ago, is once again a national research project devoted to water. Rolf Weingartner emphasised that

this project requires good hydrological knowledge. Thanks to the Atlas, basic information is available for a broad range of applications. The *Hydrological Atlas of Switzerland* demonstrates the progress made in acquiring knowledge, and for this reason it has been described as the "hydrological conscience of Switzerland".

### The effects of climate change

The ninth series for the Atlas comprises six new plates in which it is evident that the Atlas is increasingly taking into account research into climatic change. An example is the new maps showing precipitation, temperature and discharge over the past few centuries. The information given includes annual and seasonal distribution of precipitation and temperature in the Alps since 1659. There are no obvious long-term trends in precipitation, which is not the case for temperature, however, especially in the 20th century. Moreover, the maps show flooding and droughts since 1500. Thanks to our knowledge of earlier climatic conditions we can categorise and interpret present-day observations and developments more accurately.

Precipitation in the Alps is affected by weather systems among other things; for example, weather from the north-west often brings rain or snow. The Atlas shows the connection between weather systems and precipitation in the Alps using nine typical weather situations on one new map.

### The water balance in Switzerland

Knowledge about the water balance in medium-sized catchments not influenced by outside factors is important because the water balance is an accurate reflection of climatic conditions and thus reveals possible changes. In 1957, the federal authorities began to set up a network of representative basins that are characterised by largely natural discharge conditions. Changes in the water cycle will be observed using long measurement series. A new plate shows the long-term trend and seasonal distribution of precipitation and discharge in twelve catchments spread all across the country.

If one looks at larger catchments, unlike for the medium-sized basins, individual processes cannot be studied in such detail but data from a longer period can be analysed. Another new plate sheds light on current knowledge about the water balance in Switzerland in the 20th century. Overall, there have been no major changes in the water balance over the past 100 years. During the whole of the 20th century, almost exactly one third of all precipitation evaporated while the other two-thirds flowed out of Switzerland in its principal rivers. There was a significant rise in the evaporation rate over the past hundred years. In some areas this was compensated for by a higher rate of precipitation, which means that discharge hardly changed. This was not the case in the Tessin, however, where discharge fell significantly.

### Basic knowledge for use in preventing natural disasters

Another new plate focuses on bed load in mountain torrents. Following the terrible flooding in summer 1987, which caused an enormous amount of damage in Switzerland, work was started on setting up a database on bed load in mountain torrents and rivers. This database is managed by the Federal



Office for the Environment while the data is supplied by the cantonal authorities and various research institutes. Information about bed-material load is important for hydro-engineering projects, protection against flooding and planning land use, among other things.

The last new plate includes statistics on flood discharge for the period from 1971 to 2007: mean annual flood peaks, variation and seasonal patterns in annual flood peaks and trends over the period studied. As far as changes are concerned, in most cases no significant trends are obvious yet. In addition, trend analyses must be interpreted with caution since the data series that are available are, as a rule, not long enough to reveal any cyclical pattern with regard to the frequency of flooding.

Lukas Denzler, Forestry Engineer (ZFIT), Zurich

Further information about the Hydrological Atlas of Switzerland is available at: [www.hydrant.unibe.ch/hades/](http://www.hydrant.unibe.ch/hades/)  
A sample plate from the Atlas is shown below.

### Plate 2.8 Weather Types and Distribution of Precipitation throughout the European Alps

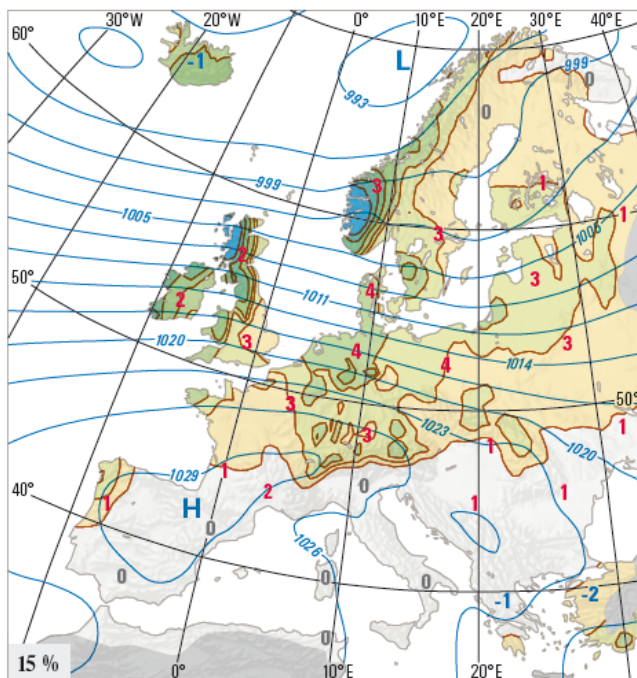
Authors: Reinhard Schiemann & Christoph Frei, Federal Office of Meteorology and Climatology MeteoSwiss

Winter: Nördliche Westlage

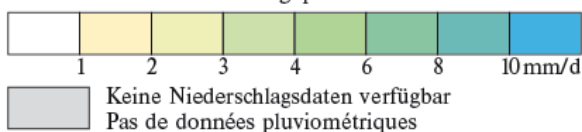
Hiver: courant d'ouest sur le nord de l'Europe

Übersicht der Wetterlage

Carte synoptique de la situation météorologique



Mittlere Niederschlagshöhen an Tagen dieser Wetterlage  
Hauteurs moyennes des précipitations pendant les jours de cette situation météorologique



Druckverteilung

Répartition des pressions

Luftdruck auf Meeresniveau [hPa]

Pression atmosphérique au niveau de la mer [hPa]

H Hochdruckgebiet  
Anticyclone

L Tiefdruckgebiet  
Dépression

## Swiss Hydrological Commission CHy of the Swiss Academy of Sciences

### Operational Hydrological

Forecasting Bern University, 14–15 June 2010

#### Improvement at all levels

Many aspects of flood forecasting have improved in recent years: more accurate weather forecasting, differentiated hydrological models, and better communication among the parties involved will be of help in coping better with future crisis situations. However, there is still a need for action in many areas, ranging from the scientific bases of forecasting to prevention. This became clear at an international conference recently held at the University of Bern. The pictures are always similar. And so it was again this spring when many parts of Poland and southern France were afflicted by major floods. There is no disputing the need for reliable and timely recognition of extreme events of this sort. Although flood forecasting models have been continually improved in recent years, great operational uncertainties are regularly apparent with respect to forecasting exactly when which areas will be flooded. About 100 experts gathered at an international conference on *Operational Hydrological Forecasting* held at the University of Bern on 14 and 15 June 2010 engaged in discussions about practical daily experience with modeling and about the scientific efforts that need to be made to close existing operational gaps. The conference was organized by the Swiss Society for Hydrology and Limnology and the Swiss Hydrological Commission, in cooperation with the Institute of Geography at the University of Bern and the Federal Office for the Environment.

#### Highly satisfactory medium-term prognoses

Flood forecasting is based on two cornerstones: measurements of runoff and precipitation data. In particular, forecasts of where, when and how much rain- or snowfall will occur is of central importance in assessing flood situations. The weather forecasting model known as COSMO, developed by an international consortium of the same name, has been successfully applied in recent years in Switzerland. This model provides short-term deterministic forecasts as well as ensemble predictions that facilitate medium-term forecasts. MeteoSwiss today uses the COSMO-2 model, which is based on a grid spacing of 2.2 km above the mountains, for short-term forecasts. This small grid size makes it possible to represent large Alpine valleys in the model and to calculate convection over the mountains explicitly. While COSMO-2 makes a deterministic forecast every three hours covering the next 24 hours, a second model – COSMO-LEPS – calculates an ensemble of 16 total possible developments over the next five days using a grid spacing of 7 km.



The IAHS Scientific Assembly at Melbourne will run from Sunday 3 July to Thursday 10 July 2010, inclusive, but IUGG begins on 28 June. In addition to the IAHS Lead and IAHS symposia and workshops, there will be many events of interest run by other IUGG associations. A summary only of the main events of interest to IAHS members is given below; full details with a description of the reasoning for holding a given event are provided at: [www.IUGG2011.com](http://www.IUGG2011.com). Abstracts should be submitted via that website.

Code	Symposia/Workshop	Lead convenor(s)
<b>IAHS Lead Symposia</b>		
<i>IAHS will be the lead for two Symposia organized jointly with other IUGG associations. The IAHS Lead Symposia will consist of invited oral presentations and submitted poster presentations that have been accepted by the Symposia Convenors and the Scientific Program Committee. J-H01 and J-H02 will each generate a Red Book</i>		
J-H01	GRACE, other remote sensing platforms and ground based methods for estimating multi-scale surface water budgets, groundwater system characterization and hydrological processes <i>IAHS (ICRS, ICSW, ICGW, ICWRS, PUB, GRACE), IAG, IAMAS</i>	Moshin Hafeez
J-H02	Hydro-climatology: Variability and change <i>IAHS (ICCLAS, ICSW, HYDROMET), IAMAS</i>	Stewart Franks
<b>IAHS Lead Workshops</b>		
J-HW01	Integrated flood management <i>IAHS (ICSW, ICWRS), IAMAS, WMO, BOM Australia</i>	Bruce Stewart
J-HW02	Interaction between fresh water and ecosystem in the coastal zone <i>IAHS (ICGW, ICWQ), IAPSO</i>	Makoto Taniguchi
J-HW03	Impacts of changing climate, snow and ice on mountain hydrology <i>IAHS (ICSIH, ICLAS, ICRS, ICGW, ICSW, PUB), IAMAS, IACS</i>	Danny Marks
J-HW04	Subglacial water: Properties, processes and role in ice-mass dynamics <i>IAHS (ICSIH), IACS</i>	Bryn Hubbard
<b>IAHS Symposia</b>		
<i>The IAHS Symposia are coded H01 – H04 and cover themes of concern to IAHS. The IAHS Symposia will consist of oral presentations and poster presentations that have been accepted by the Symposia Convenors and the Scientific Program Committee, and will each generate a Red Book</i>		
H01	Conceptual and modelling studies of integrated groundwater, surface water, and ecological systems	Gunnar Nützmann
H02	Cold regions hydrology in a changing climate <i>ICSIH, PUB</i>	Daqing Yang
H03	Risk in Water Resources Management	Günter Blöschl
H04	Assessment of water quality under changing climate conditions	Jake Peters
<b>IAHS Workshops</b>		
HW01	Tracer applications in sediment research <i>ICCE, ICT, ICWQ, PUB</i>	Valentin Golosov
HW02	Understanding and quantifying physical and geochemical processes during artificial recharge of groundwater <i>ICGW, ICWQ</i>	Henning Prommer
HW03	Regional groundwater modelling: Approaches, challenges, and future directions <i>ICGW, ICT</i>	Howard Reeves
HW04	Snow and ice hydrology: Principles, processes and prediction <i>ICSIH, ICGW, ICSW</i>	Tim Link
HW05	Revisiting paired catchment experiments in forest hydrology <i>ICSW, ICRS</i>	Vazken Andréassian
HW06	Expert judgement versus statistical goodness-of-fit for hydrological model evaluation <i>ICSW, ICWRS, STAHY</i>	Charles Perrin
HW07	Hydro-geomorphology <i>ICSW, ICCE</i>	Christophe Cudennec
HW08	Tracer hydrology as a tool for estimating flow parameters, groundwater dynamics, pollution transport and bioremediation processes in heterogeneous systems <i>ICT, ICGW</i>	Gian Maria Zuppi

HW09	Revaluing system knowledge in water resources management/ICWRS, ICWQ	Nick van de Giesen
HW10	Water quality and sediment prediction in ungauged basins/ICWQ, ICCE	Berit Arheimer
HW11	Water supply and water quality in large metropolitan areas and megacities/ICWQ, ICWRS	Valentina Krysanova
HW12	Quality and quantity aspects of green and blue water: Impact on agriculture, environment, energy and industry/ICWQ, ICWRS	Uttam Sharma
HW13	Recent development of statistical tools for hydrological application/STAHY, ICSW, ICWRS	Salvatore Grimaldi
HW14	Education in the hydrological sciences EDU	Arthur Askew
<b>Other Symposia of Interest</b>		
U-06	Geoengineering: what are the potentials for climate intervention, carbon scrubbing, and other approaches to moderate climate change and its impacts? <i>IAMAS and IAHS, IAPSO, IASPEI</i>	Michael MacCracken Alan Robock
U-09	Do we really know the hydrological cycle? IAHS	Pierre Hubert
U-11	Earth and Space Science in Africa/AGA – as part of IUGG Geoscience in Africa initiative and the eGY-Africa program., with IAG, IAHS, IAMAS, IAPSO, IASPEI, IAVCEI, African Geospace Society (AGS), Association of African Universities (AAU), Africa Earth Observing Network (AEON), AfricaArray; ICSU Regional Office for Africa, CODATA, International Network for the Availability of Scientific Publications (INASP), UN Global Alliance for Information and Communication Technologies and Development (UN-GAID), US InterAcademy Panel on International Issues (IAP); European Enabling Grid for e-Science (EGEE); Geoscience Information in Africa (GIRAF); and the Abdus Salam International Centre for Theoretical Physics in Trieste (ICTP).	Charles Barton
U-12	Early Career Scientists <i>IUGG and IACS, IAG, IAGA, IAHS, IAMAS, IAPSO, IASPEI, IAVCEI</i>	Harsh Gupta Laszlo Szarka
J-C03	Snow–atmosphere interactions in mountains/IACS, and IAMAS, IAHS(ICSIH)	Michael Lehning Marc Parlange Pierre Etchevers Eric Brun
J-M02	Data assimilation and ensemble forecasting for weather and climate <i>IAMAS (ICDM, ICMA), IAPSO, IAHS, IAGA, IACS</i>	William Lahoz
J-M06	High-impact weather and extreme climate events <i>IAMAS (ICCL, ICDM), IAHS</i>	Xuebin Zhang Richard Swinbank Ronald Stewart
J-M10	Monsoons, tropical cyclones and tropical dynamics/IAMAS (ICCL,ICDM), IAPSO, IACS, IAHS,GEWEX, CLIVAR	Jianping Li John McBride
J-M13	Precipitation measurements; instrumentation and statistics at all scales/IAMAS(ICCP), IAHS	Daniel Schertzer

IAHS Members and others are invited to submit abstracts for any of the above events via the IUGG2011 website:

**[www.IUGG2011.com](http://www.IUGG2011.com)**

**Abstract deadline for IAHS Lead and IAHS Symposia (J-H01, J-H02 and H01–H04) 8 November 2010**

This early deadline is essential to enable preparation of papers for publication in the six Red Books.

Notice of acceptance of abstracts by 1 December, and full paper required by 31 December.

**Abstract deadline for ALL other events, 17 January 2011**





## Weather Radar and Hydrology

The International Symposium on *Weather Radar and Hydrology* (WRaH) will be held in the United Kingdom in 2011 from 18 to 21 April at the University of Exeter. The Symposium will provide a forum for the exchange of experiences and ideas on the use of weather radar in hydrology.

The theme of the 2011 Symposium will place emphasis on user applications of weather radar for flood forecasting and water management. All sessions will aim to combine developments in weather radar with advances in its hydrological application. You are strongly encouraged to submit abstracts of papers for the Symposium with this focus in mind. We aim to promote a strong interchange between researchers, practitioners in the water industry and those making advances in weather radar technology.

This is the 8th in a series of International Symposia, begun in 1989 at the University of Salford (UK) under the title "Hydrological Applications of Weather Radar". Subsequent symposia have been convened in Germany, Brazil, USA, Japan, Australia and France. This 8th International Symposium marks a return to the UK after 20 years of successful symposia across the world.

Papers will be peer-reviewed and published as part of the IAHS (Red Book) Series of Proceedings and Reports. A selection of papers, in extended form, will be published in a Special Issue of *Hydrological Sciences Journal*. The deadline for submitting abstracts is 4 October 2010; authors will be notified of acceptance in mid-November 2010. For inclusion in the Symposium Proceedings, a 6-page paper is required by 28 February 2011. Papers invited for possible inclusion in the journal Special Issue are needed by 31 March 2011.

### Submission deadlines

Abstract submission – 4 October 2010

Notification of acceptance of abstract – mid-November 2010

Symposium proceedings 6-page paper – 28 February 2011

Full papers for journal Special Issue (optional) – 31 March 2011



## Calendar of Meetings Organized/Sponsored by IAHS and Its Commissions

2010	Conference	Contact details
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.	<a href="#">11th International Symposium on River Sedimentation (ISRS)</a>	Technical aspects: Prof Gerrit Basson <a href="mailto:gbasson@sun.ac.za">gbasson@sun.ac.za</a> ; tel: +27 21 808 4355 Other aspects: Marechia Basson <a href="mailto:msb@aspt.co.za">msb@aspt.co.za</a> ; tel: +27 79 4909 210
Tianjin, China 7–11 September	<a href="#">9th International Conference on Hydroinformatics HIC2010</a>	
Krakow, Poland 12–16 September	XXXVIIIth IAH Congress	Stanislaw Witczak, tel: +48 (12) 617 2437; <a href="mailto:witczak@uci.agh.edu.pl">witczak@uci.agh.edu.pl</a>
Prague, Czech Republic 20–23 September	<a href="#">HydroPredict'2010 : 2nd International Interdisciplinary Conference on Predictions for Hydrology, Ecology, and Water Resources Management</a>	Dr Zbynek Hrkal, <a href="mailto:zbynek_hrkal@vuv.cz">zbynek_hrkal@vuv.cz</a> ; Prof. Hans-Peter Nachtnebel, <a href="mailto:hans_peter.nachtnebel@boku.ac.at">hans_peter.nachtnebel@boku.ac.at</a> <a href="http://www.natur.cuni.cz/hydropredict2010/">http://www.natur.cuni.cz/hydropredict2010/</a>
Jackson Hole, USA 27–30 September	<a href="#">Remote Sensing and Hydrology 2010</a>	Christopher Neale (VP ICRS); <a href="mailto:christopher.neale@usu.edu">christopher.neale@usu.edu</a>
Fez, Morocco 25–29 October	6th World FRIEND Conference <i>Global Change: Facing Risks and Threats to Water Resources</i>	Eric Servat, <a href="mailto:friend2010@msem.univ-montp2.fr">friend2010@msem.univ-montp2.fr</a> <a href="http://www.unesco.org/friend2010/water/ihp/pdf/call_papers.pdf">http://www.unesco.org/friend2010/water/ihp/pdf/call_papers.pdf</a>

<b>Nanjing, China</b> 19–21 November	IWRM 2010, 5th International Symposium on Integrated Water Resources Management : Water Resources Sustainability in a Changing Environment	<a href="mailto:IWRM5@yahoo.com.cn">IWRM5@yahoo.com.cn</a>
<b>Djibouti, Republic of Djibouti</b> 22–25 November	ARGEO-C3, African Rift Geothermal Resources	CERD, PO Box n°486, Djibouti, Republic of Djibouti tel: +253 35 27 95; <a href="mailto:argeo-c3-djibouti@intnet.dj">argeo-c3-djibouti@intnet.dj</a>
<b>Paris, France</b> 6–8 December	International Conference on Challenges and New Directions in Transboundary Aquifers Management	

2011	Conference	Contact details
<b>Algiers, Algeria</b> 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; <a href="mailto:CIREDD4@ensh.dz">CIREDD4@ensh.dz</a> or <a href="mailto:CIREDD4@gmail.com">CIREDD4@gmail.com</a>
<b>Vienna, Austria</b> 11–14 April 2011	The Status and Future of the World's Large Rivers	Helmut Habersack, <a href="mailto:helmut.habersack@boku.ac.at">helmut.habersack@boku.ac.at</a> Des Walling, <a href="mailto:d.e.walling@exeter.ac.uk">d.e.walling@exeter.ac.uk</a>
<b>Melbourne, Australia</b> 27 June–8 July 2011	XXVth IUGG General Assembly	
<b>Leipziger Kubus, Germany</b> 19–22 September	ModelCare 2011, The 8th International Conference on Calibration and Reliability in Groundwater Modelling	<a href="mailto:modelcare2011@fu-confirm.de">modelcare2011@fu-confirm.de</a>
<b>Tsukuba, Japan</b> 27–30 September	5th International Conference on Flood Management	

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

# International Association of Hydrological Sciences Association Internationale des Sciences Hydrologiques


[www.iahs.info](http://www.iahs.info)

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### Statistics in Hydrology Working Group

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### ICGW, Groundwater

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## Sediment Dynamics for a Changing Future

Edited by Kazimierz Banasik, Arthur J. Horowitz, Philip N. Owens, Mike Stone & Des E. Walling

IAHS Publ. 337 (2010) ISBN 978-1-907161-10-0, 376 + viii pp. Price £74.00



The 48 papers in this volume aim to advance our understanding of the processes of erosion and sedimentation in relation to sediment dynamics and water quality. Keynote papers are followed by papers grouped into three main themes. Those on *Human Impact on Sediment Budgets* are primarily concerned with the influence of land-use change on catchment sediment yields and/or fluxes. The group on *The Structure, Functioning and Management of Fluvial Sediment Systems* provide valuable information on topics including the dynamics of flood plain sedimentation, temporal variation of sediment parameters and the important influence of sediment on aquatic ecosystems. The third group dealing with *Experiment-based and Modelling Approaches to Sediment Research*, highlight the important role of both monitoring and modelling studies in generating an improved understanding of catchment sediment dynamics, sediment fluxes and river water quality.