No. 93 May 2007

THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

Contents

New research journal
BHS joins forces with NAH to launch *Hydrology Research* in 2008

Keep the kids amused...
ISDR has a new game to download

Travel grants available
BHS support to attend conferences

President's Piece
More news on progress with chartered status, and much else

Update on the ERB
New UK rep required

Fifth FRIEND World Conference
A further report by BHS-sponsored delegates to this conference in Havana, Cuba

News from Members

The AGU Fall meeting in San Franscisco
A report from this huge event: 1532 papers on hydrology alone.....

Drought Forecasting
BHS National meeting on what's needed and what's possible...

Current issues in hydrometry
Pennines Group meeting on instrumentation challenges

Social impacts of flooding in Scotland
SHG meeting at Royal Society of Edinburgh

Carbon in peatlands
PeatNet Conference in Wageningen on the current and future research

Hyporheic Network
New NERC initiative

Wetlands system to control runoff
Joint SHG and IEMA meeting

News from the regions
Updates from the SHG and the SW Section

Diary of forthcoming events

Circulation is published quarterly. It is free to members of the British Hydrological Society and costs £25 to nonmembers on annual subscription.

- Membership enquiries: Tim Fuller, BHS Secretary, Institution of Civil Engineers, 1-7 Great George Street, London SW1P 3AA. *Tel 0207 665 2234, Email bhs@ice.org.uk.*
- Editor: Celia Kirby, BHS Technical Secretary, *Tel 01544 230054, Email celia.kirby@btinternet.com*
- Web pages: **http://www.hydrology.org.uk/**

Circulation is indexed in *Geosystems' Hydrotitles* & *GeoArchive* and *NISC HydroROM.*

Hydrology Research – BHS and the Nordic Association for Hydrology join forces for new journal

Following an article on this topic in the previous issue of *Circulation*, BHS now has an agreement with the Nordic Association for Hydrology (NHF) and IWA Publishing (IWAP) to jointly edit and produce a new journal to be called *Hydrology Research* which, from January 2008, will replace the existing NHF/IWAP journal *Nordic Hydrology*. For authors, an advantage of BHS joining NHF and IWAP in this venture is that the ISI recognition of *Nordic Hydrology* will be reassigned to *Hydrology Research*.

BHS have appointed Dr **Ian Littlewood** as Joint Editor of the new journal. Ian will work closely with the editor of *Nordic Hydrology*, Professor Dan Rosbjerg of the Technical University of Denmark. It is intended to have six issues per year rather than the current four for *Nordic Hydrology*.

Starting 1 May 2007, we would urge BHS members and others to submit papers to *Nordic Hydrology*. Papers submitted to *Nordic Hydrology* and published after the end of 2007 will appear in *Hydrology Research*. If you have any queries, please contact one of the Joint Editors by e-mail: Dan Rosbjerg at dr@er.dtu.dk or Ian Littlewood at ianlittlewood505@btinternet.com.

The next edition of *Circulation* will include an article describing progress with establishing *Hydrology Research*, but essentially the journal will publish papers broadly focused on hydrology and water resources, and will follow the current policy of *Nordic Hydrology* of being international in its outlook (see: http://www.iwaponline.com/nh/i2a.htm).

In an earlier questionnaire to members, there was strong support for a BHS journal but to have attempted to start a new one from scratch was considered to be not the best way forward. BHS is delighted to have joined forces with the NHF; please support this exciting venture and use *Hydrology Research* to your best advantage.

Frank Farquharson
President-Elect

New ISDR 'Stop disasters!' game

The International Strategy for Disaster Reduction (ISDR) has launched a new on-line game within the framework of the 2006–2007 'Disaster Risk Reduction Begins at School' Campaign. The thinking behind this is that natural hazards, such as floods, droughts and earthquakes, do not need to become disasters as many measures can be taken to reduce their impact.

Children are one of the most vulnerable groups when disasters occur, but if they are taught about the risks posed by natural hazards at an early age, they will have a better chance of saving their lives when exposed to them. The on-line game aims to teach children to build safer villages and cities against disasters. Through play, children will learn how the location and the construction materials of houses can make a difference and how early warning systems, evacuation plans and education can save lives. Children are the future architects, mayors, doctors and parents of the world of tomorrow. If they know what to do to reduce the impact of disasters, they will create a safer world.

The game also includes facts and figures about disasters such as floods, hurricanes and droughts. See http://www.stopdisastersgame.org/ for more details.

Travel grants

Travel grants are awarded from the Society's general funds to help BHS members whose travel expenses to attend scientific meetings are not met by an employer. Applicants should have been members of the Society for at least six months. The amount will depend on the nature and location of the meeting and the case put forward.

Priority is given to members under 35 or retired from employment, who are presenting papers and who have not previously received support from BHS. Successful applicants will be expected to write a short report for *Circulation*. Travel grant applications should be made to the Hon Treasurer at least two months before the conference or meeting.

The Exeter Fund, administered by the Society, offers grants to British hydrologists to take part in IAHS / IUGG events.

To apply, use the form at *www.hydrology.org.uk/about_awards.htm* or contact **Peter Ede**, Mott MacDonald Group, Demeter House, Station Road, Cambridge, CB1 2RS *(tel 01223 463690, email peter.ede @mottmac.com).*

New members

A warm welcome to the following new members of the Society. We hope they will play an active part in BHS and contribute occasionally to *Circulation*: we always welcome news and views from members, old and new.

Dr Soheila Amin-Hanjani ..... Defra, London
Lucy J Baker ..... Environment Agency, Warrington
Dr Roger E Baker ..... Environment Agency, Caversham
Mark Beeken ..... Environment Agency, Exeter
Robert Bissell ..... Environment Agency, Bangor
Mark C Blackmore ..... Atkins Water, Peterborough
Rachel Carrie ..... Mott Macdonald, Cambridge
Richard P Chadd ..... Environment Agency, Spalding
Heidi Cherry ..... Environment Agency, Wallingford
Grace Chillingworth ..... SLR Consulting Ltd, Shrewsbury
Drew Constable ..... Environment Agency, Spalding
Dr Frances C Elwell ..... Mott MacDonald, Cambridge
Kate Evans ..... Environment Agency, Shrewsbury
Helen M Gibbs ..... Kings College London
Andrew Gill ..... Atkins, Berkshire
James K D Glover ..... Mott MacDonald, Cambridge
Karen L Gowlett ..... Environment Agency, Exminster
Lorna I Harris ..... SEPA, Stirling
Karen Hersschens ..... Enviros, London
Tasmin R Howels ..... Environment Agency, Exminster
Gregory O Hughes ..... ADAS Consulting Ltd, Wolverhampton
Kathryn A Hutchinson ..... Kings College London
Charlotte Jameson ..... Grontmij, Leeds
Dr Michael O Kehinde ..... Environment Agency, Ipswich
Matthew Kennedy ..... University of Birmingham
Sarah J Kirby ..... University of Birmingham
Dr Stefan Krause ..... Centre for Sustainable Water Management, Lancaster
David A Lavers ..... Centre for Ecology & Hydrology, Wallingford
Lindy Miller ..... Anderslite, London
Catherine Moss ..... Environment Agency, Worthing
Dr Mika R Peck ..... University of Sussex, Brighton
Syin Yi Phoon ..... Envirocentre Ltd, Glasgow
Timothy J Power ..... Entec UK Ltd, London
Amy E Rix ..... University of Birmingham
Rebekah E L Rochester ..... University College London
Laura Sanderson ..... University of Birmingham
Paul A Scholefield ..... Centre for Sustainable Water Management, Lancaster
Chabungbam Rajagopal Singh ..... University College London
Mark Smith ..... University of Durham
Anna Steele ..... Environment Agency, Preston
Dr Eliot D Taylor ..... Atkins Ltd, Witney
Samantha Taylor-Head ..... Environment Agency, Cardiff
Elliott Tinton ..... Environment Agency, Worthing
Miranda Tiplady ..... Jacobs, Glasgow
Dr Christopher M Tomlin ..... Environment Agency, Preston
Rosa Tyson ..... Environment Agency, Wallingford
Graham Weaver ..... Natural England, Peterborough
Dr Jodie Whitehead ..... ADAS, Mansfield
Dr Mark I Whiteman ..... Environment Agency, Leeds
Alastair J Wilson ..... Environment Agency, Hatfield

Editorial

Keen-eyed readers will have noted the change in Editor listed on the front page and also on our web pages. John Griffin has stepped down for a while because of extra CEH commitments. So you have me back temporarily. I will try and keep up John's high standards — and hopefully not get too carried away with design issues (see our President's comments). All contributions, especially news of members' activities, are always welcome.

Celia Kirby

President's Piece

As I start my last six months of my term as President, the flooding concerns of winter have subsided and we are already into yet another extended dry spell, which no doubt someone soon in the media will claim is the start of another drought caused by Global Warming. Another summer flash-flood of Boscastle proportions, especially if an urban environment in the south-east is affected, will only serve to confirm the media's proposition that the next 'sauna-age' (as opposed to 'ice-age') is upon us already!

Whilst extreme events become more common, at the same time ever-changing legislation brings new analytical requirements in which the hydrologist has an increasingly important role. Just as we start to get to grips with the Water Framework Directive and regimes such as River Basin Management Plans, along comes the EU's Floods Directive and goodness knows what further change that will initiate.

We really must'nt grumble too much about this because as a result the demand for the professional hydrologist is ever increasing, and according to the rules of supply and demand, this will eventually result in increasing remuneration for hydrologists. As society and employers depend more and more on the expertise of the professional hydrologist, so the need follows for a defined level of competency to be attained in our career paths. This is why I believe that the timing could not be better for making a strong case for Chartered Hydrologist status. More on this in the next issue when I hope we will be close to making a recommendation on whether BHS should submit a Petition to the Privy Council for a Royal Charter.

More impacts of change to report. Normally I can wait until the end of the year before announcing changes to the Main Committee but events have dictated otherwise. Firstly the reorganisation at CEH is taking its toll on hydrologists career life-span. Not only has our President-Elect Frank Farquharson already left full-time employment at Wallingford to take up new ventures (see News from Members), but Ian Littlewood, the long-serving CEH representative, has now retired and will be replaced on the Main Committee by Gareth Old, Senior Scientific Officer at CEH Wallingford. Gareth specialises in fluvial geomorphology and we welcome him as the new CEH representative.

I would like to thank Ian for his service to BHS over many years and for his enthusiastic support for initiatives such as IASH's PUB (Prediction in Ungauged Basins) decade. But although Ian will be giving up his committee work, BHS will not be losing his services completely as Ian has agreed to take on an important new role as joint Editor of the re-launched journal to be known as 'Hydrology Research'. Further details of this important development are outlined on the front page.

Another knock-on affect (albeit temporary) of upheavals at CEH is that for the next year John Griffin will be reducing the time he has available as Editor of Circulation and will concentrate what little time he has on maintaining and improving the web-site. We are extremely fortunate that Celia Kirby, our newly appointed part-time technical Secretary, has agreed to take on John's responsibilities as Acting Editor for the next year. Most long-standing members will know that Celia was Editor of this newsletter in the early days and has been a long-serving member of the Committee ever since. She has been active in internet journal preparation for many years and as Broadband has reached even rural Kington, Herefordshire, we might be OK !

Celia will be taking this opportunity to review the style, format and content of Circulation which has changed very little in the last 20 years. Should we continue with the A4 size or perhaps go to an A5 booklet format so that we can save the costs of postage ? Should we even give up producing a printed version and alternatively simply post it on the web-site for members to download, or send it out via email ? Does the content need to change ? If you have any strong views about how Circulation should develop, this is your chance to give have a say. Please email Celia on celia.kirby@btinernet.com or write to her at 1 Kingswood Road, Kington, Herefordshire, HR5 3HE. What is for certain is that we will NOT be conducting a premium-rate 'phone in asking you to choose your preferred option!

The final change to report is that Hilary Smithers has decided to stand-down from the Main Committee on which she has served for many years in various capacities including more recently as the CIWEM representative. On behalf of the Society I would like to thank Hilary for her long service and for the outstanding contribution she has made to BHS over so many years. The new CIWEM nominated member will be Dr Colin Fenn, who is Chairman of CIWEM's Water Resources Panel. Colin is an Independent Consultant and was previously Head of Atkins Water and Managing Director of HR Wallinford. We are fortunate to have someone of Colin' stature and experience and I'm sure he will make a valuable contribution to the Society.

Rod Hawnt

European Network of Experimental and Representative Basins (ERB)

New UK rep. required

Established in 1986, the ERB is an open member network promoting international cooperation between European institutes and research teams involved in hydrological studies of catchments. The main output from ERB comes through biennial conferences and associated Proceedings published in the UNESCO Technical Documents in Hydrology series. Until he retired from CEH recently, the UK Correspondent was Ian Littlewood. Ian hosted the ERB meeting in 1992 and has edited/co-edited three ERB Proceedings (1992, 1996 and 1998). The Eleventh ERB Conference, co-sponsored by UNESCO/FRIEND and IAHS/PUB, was held in Luxembourg, September 2006 (see http://erb2006.lippmann.lu/).

The UK Committee for National and International Hydrology (UKCNIH) is now seeking a replacement for Ian and invites expressions of interest from individuals willing to become UK Correspondent for ERB. Those interested may wish to contact Ian (ianlittlewood505@btinternet.com) for more background information.

The ERB Steering Committee (SC) comprises the National Correspondents of member countries (currently Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Italy, Luxembourg, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland and United Kingdom). The SC meets in non-Conference years to plan the next Conference, etc. The next ERB Conference (2008) will held at Cracow, Poland.

Please contact **Gwyn Rees**, Secretary UKCNIH, (hgrees@ceh.ac.uk) by 31 May 2007 if you are interested.

Climate variability and change: hydrological impacts — contd.

Fifth FRIEND World Conference
Havana, Cuba
27 November – 1 December 2006

As promised in the last issue of Circulation, *after Maria Solera Garcia's interesting 'taster', we reproduce here some more impressions from the FRIEND meeting in Havana**

The international FRIEND (Flow Regimes from International Experimental and Network Data; http://ne-friend.bafg.de/servlet/is/7397/) research programme of UNESCO has developed over the last two decades into a global network for exchange of hydrological knowledge and data. FRIEND encompasses participants from universities, research institutes and operational agencies plus policy-makers and water-users: hence, it seeks to bridge the gap between theory and practice, to identify both the most pressing 'blue skies' and applied water issues. Every four years the results from the eight FRIEND regional groups (spanning over 75 countries) are reported to the wider scientific community at an international conference.

A primary focus of the conference was to investigate the ways in which *"advances in analytical techniques and process hydrology are improving our assessment of water resource variability and the impacts of environmental change"*. To help address this focus, the conference sought to build and strengthen links between hydrology and the related disciplines of climatology, hydroecology and hydrogeology, and also between IAHS and WMO international programmes. The conference was based around four key themes: (1) data, (2) hydrological extremes, (3) hydroclimatology and (4) ecosystems. It is very difficult to choose papers to highlight from the large and diverse programme; therefore, this report mainly targets sessions during which we were presenters or chairs.

The conference opened with a plenary session, which included a welcome from the UNESCO Latin America and the Caribbean Regional Hydrologist (**Maria Donoso**) and the Chair of the FRIEND Inter-Group Coordinating Committee (**Eric Servat**, UMR HydroSciences Montpellier, France). **Eduardo Planos** (Chair of the Local Organising Committee) then gave a review of the hydrology of Cuba and the hydroclimatological extremes experienced by this 110860 km² island, located where the Caribbean and Atlantic meet. An ***introductory session*** of keynote addresses followed immediately, during which **Alan Gustard** (CEH, UK) reviewed the key achievements of FRIEND and the opportunities for future international cooperation. He identified the need to understand human-induced versus natural variability in river flow regimes, and the prediction of both floods and droughts at ungauged sites, as key issues for FRIEND to continue to engage with. Capacity-building and education were also identified as important components of FRIEND activities. Thought provokingly, Alan suggested ways in which cooperation could be improved and the degree of duplication reduced between international hydrological initiatives such as FRIEND, HELP and PUB.

Trevor Daniell (University of Adelaide) then talked about the four dilemmas for the water resource modeller: human impacts, complexity, variability and non-homogeneity. His presentation raised a number of suggestions and questions for future work, and pointed towards methods for optimising integrated river basin management. He concluded that there was no definitive answer to addressing these four dilemmas, so water resource modellers needed to reflect carefully on the purpose of their models, input datasets and methods to deal with tomorrow's complex, uncertain and variable conditions.

The ***hydrological extremes*** session was subdivided into three sub-themes. Under the sub-theme of flood prediction and forecasting, **Erik Querner** (Alterra, The Netherlands) undertook an impact assessment of measures to flood the upper part of a Dutch river basin to reduce downstream flooding. Modelling of surface–groundwater identified that water-holding in the headwaters could significantly reduce lowland peak flows, although this would need policy makers to accept local flooding of upstream agricultural land as a means to reduce flooding of more densely populated downstream areas. **Ana Deisy Lopez Ramos** (Servicio Nacional de Estudios Territorales, El Salvador) talked about a recent experience of a flood early warning system for El Salvador (SNET). She highlighted the need for a well integrated system design and the need to tailor such a system to the idiosyncrasies of the country and community in question.

Ida Mitrami (INSMET, Cuba) assessed the skill of the MM5v3 model for rainfall forecasting of Hurricanes *Charlie* and *Ivan* in Cuba. Although the model showed some over-prediction compared with observational rainfall, results were concluded to be generally acceptable. She suggested future model developments for Cuban rainfall forecasting should include a finer mesh and introduction of an explicit convective process scheme.

Jacques Lavabre (Cemagref, France) introduced AIGA (a flood forecasting tool) and its application in the French Mediterranean. AIGA provides a map of rain-related and hydrological risk on a 1 km² grid for the entire French hydrographic network at an hourly time step, including ungauged sites. **Josyane Ronchail** (Université Paris LOCEAN-IPSL, France) discussed the impact of Amazon tributary inflows on major floods at Óbidos. This paper highlighted clearly the significance of stacking of peak flows from tributaries in generating major floods

* A full list of oral and poster papers is still available on the conference website at: http://www.friend-amigo.org/conferencia2006.

The proceedings of the 5th FRIEND World Conference, edited by Siegfried Demuth, Alan Gustard, Eduardo Planos, Fred Scatena and Eric Servat, have been published as *IAHS publication no. 308*, ISBN 0144-7815.

downstream of their confluence with the main river.

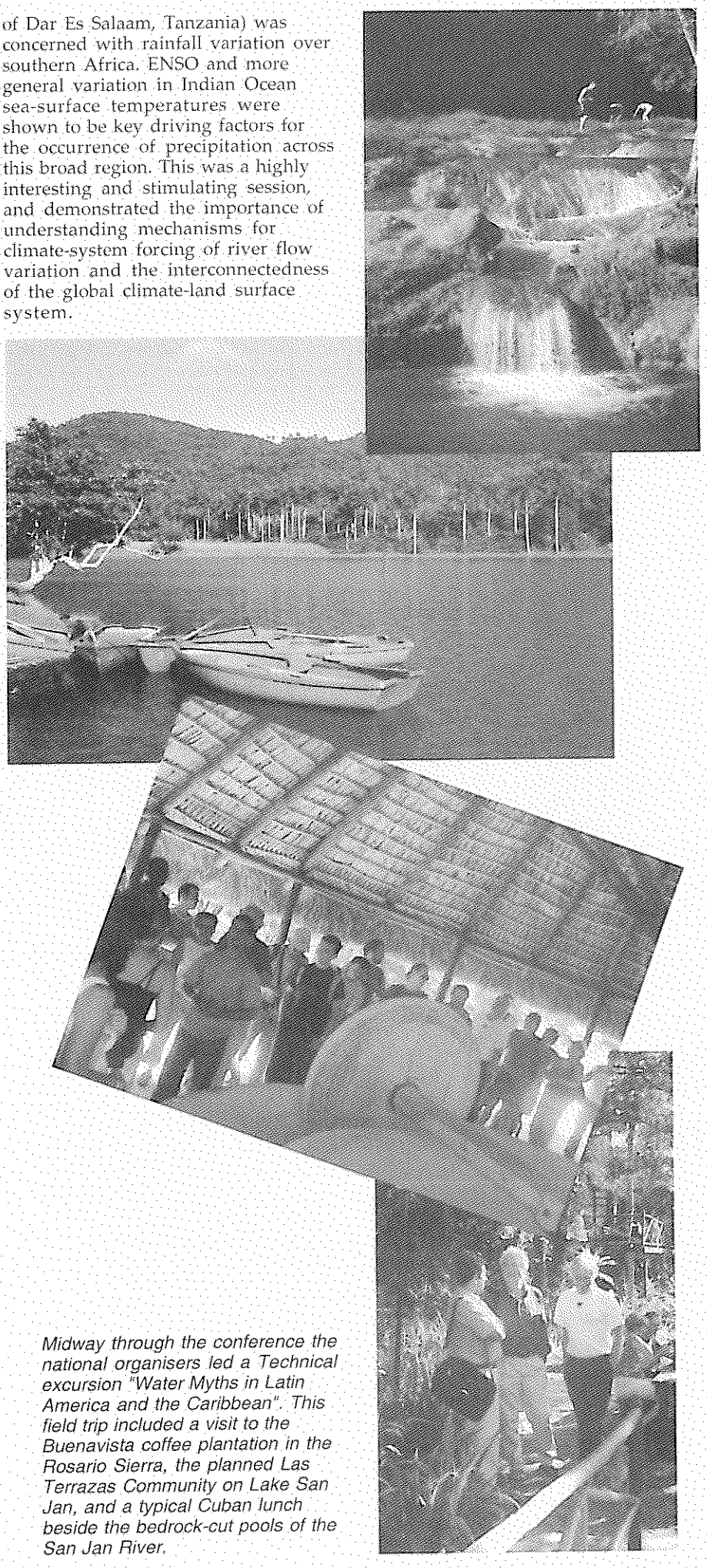
Mathieu Ribatet (University of Quebec, Canada) finished off this sub-theme by presenting a very accessible and pragmatic talk that evaluated the added effort in performing a Bayesian analysis against the improvement in results compared with a simpler Flood Index model.

The ***large-scale variability and teleconnections*** session was based around the broad subject of large-scale and remote forcing of hydrological variability. The research presented in this session covered a broad range of sub-topics, ranging from linkages between continental-scale air-masses and river flow, causes of drought and precipitation variability, to diurnal cycles in hydroclimatic variability. The geographic spread of the studies reported was equally wide, covering central America, Europe, the northern North Atlantic periphery, southern Africa and southeast Asia. The first presentation in the session (by **Christian Birkel,** Universidad de Costa Rica) gave an account of the temporal and spatial behaviour of river flow droughts in Costa Rica. Although the 1973–2003 study period was too short to fully consider trends in drought occurrence, statistically significant correlations between Costa Rican river flow and the ENSO and South Pacific Oscillation climate patterns were identified.

David Hannah (University of Birmingham, UK) then spoke about associations between monthly air-mass frequencies and annual river flow regime shape (seasonality) and magnitude in Western Europe. These associations were used to develop predictive statistical models for both regime magnitude and shape as a means of assessing the climatic sensitivity of river flow. **Daniel Kingston** (University of Birmingham, UK) gave an overview of work on large-scale climatic controls on the occurrence of high and low river flow for regions spanning the northern North Atlantic basin. Key findings included a North Atlantic Oscillation (NAO)-related trans-Atlantic inverse correlation of river flow and also inverse correlation between northern and southern Scandinavia.

The next talk (**Maria Solera-Garcia**, Lancaster University, UK) focused on variability in net radiation, evapotranspiration, rainfall and river flow in southeast Asia, using a data-based mechanistic model as a tool. The model was found to identify diurnal variation in net radiation and latent heat but was somewhat poorer for rainfall and river flow.

The final presentation in this session (**Patrick Valimba**, University of Dar Es Salaam, Tanzania) was concerned with rainfall variation over southern Africa. ENSO and more general variation in Indian Ocean sea-surface temperatures were shown to be key driving factors for the occurrence of precipitation across this broad region. This was a highly interesting and stimulating session, and demonstrated the importance of understanding mechanisms for climate-system forcing of river flow variation and the interconnectedness of the global climate-land surface system.



Midway through the conference the national organisers led a Technical excursion "Water Myths in Latin America and the Caribbean". This field trip included a visit to the Buenavista coffee plantation in the Rosario Sierra, the planned Las Terrazas Community on Lake San Jan, and a typical Cuban lunch beside the bedrock-cut pools of the San Jan River.

The topic of the last morning of the conference lent itself well to lively scientific debate – the detection and attribution of ***trends*** is an often-contentious area of hydrology which faces many inherent statistical and methodological obstacles. These were summarised by the thought-provoking final presentation of the session by **Zbigniew Kudzewicz** (Polish Academy of Sciences).

Papers were presented from a wide range of European countries, although, unfortunately, there were no presentations from the other FRIEND regions. The first three papers were from the UK. **Harry Dixon** (University of Birmingham) applied trend analyses to data from catchments in Wales and the English Midlands, and found increases in both high and low flows, but highlighted that signals varied depending on the length of record used for analysis. The next study adopted a UK-wide focus – **Jamie Hannaford** (CEH Wallingford) discussed trends in a 'benchmark' network of natural catchments, which enabled 'natural' variability to be discerned from artificial disturbances on stream flows (such as impoundments and abstractions). Both of these presenters noted that a key obstacle in attributing trends to any climatic-driven cause is the relative lack of long-term hydrometric records in the UK; cue **Gwyneth Cole** (CEH Wallingford), who collated data from a range of sources (including anecdotal information from the British Hydrological Society's chronology of hydrological events) to build a chronology of major droughts in England and Wales. Important parallels between contemporary droughts and historical events could be recognised such as between the 2004–06 drought, caused by successive dry winters, and conditions which prevailed in the late 19th Century.

The next four papers were from continental Europe. A regional view of trends in Nordic countries was provided by **Hege Hisdal** (Norwegian Water Resources and Energy Directorate, NVE), who found regional variations in trends observed across Scandinavia, and also applied climate change scenarios to develop future projections for Norwegian catchments, finding increased drought severity and increased flooding in some regions. **Ladislav Holko** (Slovak Academy of Sciences) examined changes in three small mountain catchments in Germany, the Czech Republic and Slovakia, choosing this environment because of the importance of mountains in water supply and also because human disturbances on flow regimes were relatively minor in these areas. Key results included changes to the seasonality of maximum annual runoff and in the characteristics of summer runoff events. Next, **Benjamin Renard** (Cemagref, France) examined evidence for trends in floods and droughts in France. Whilst trends could be recognised, it is inconclusive as to whether climate change has influenced hydrological extremes; individual catchments often showed significant trends but regional signals were far less compelling. Many trends could be attributed to non-climatic factors (e.g. step changes induced by rating curve changes). The temporal and spatial extent increased considerably for the last paper – **Pavla Pekarova** (Slovak Academy of Sciences) who discussed cyclicty in very long (150 years) records for large European rivers. Although decadal periods of above and below discharge relationships were identified, no overall trends were detected.

In summary, it was a broad-ranging session, but it was notable how complementary the papers were to each other; similar methodological obstacles recurred across the studies, such as the limited length of many hydrometric records and the confounding effects of human disturbances on flow regimes. Many conclusions were broadly similar, with statistically significant changes found at individual stations, but more ambiguous signals at a regional level. The overall message apparent from observational data is that evidence for climate change effects on floods or droughts is generally inconclusive at present.

Across the five days, the 5th World FRIEND Conference clearly illustrated the benefits of the international dimension of the FRIEND network (i.e. exchange of ideas, methods and data between different environments) and aided in highlighting some of the key issues hydrologists and society will face in the 21st century.

We are grateful to the British Hydrological Society for providing travel grants to help us attend the conference.

David Hannah and Daniel Kingston
University of Birmingham

Jamie Hannaford
Centre for Ecology and Hydrology

News from members

In November **Tim Davie** (ex-Queen Mary College, University of London, and former BHS Southern Section Committee member) was elected President of the New Zealand Hydrological Society. Tim returned to New Zealand in 2002 and now works as a scientist for Landcare Research near Christchurch. He has maintained his membership of BHS and is keen to promote links betwen the two societies. [We've even been talking about more positive links for the international conference they are planning for their 50th anniversary in 2011 – *Ed.*]

Following the Scottish Hydrological Group's AGM on 28th March, **Manuala Toth** has taken over from **Mike Cranston** as Hon Sec of the SHG. The success of the SHG and its events is a reflection on the hard work and energy that Mike has put into this role over the last seven years. The strong links with the BHS is due in no small part to Mike's work and the SHG have asked us to record their thanks to Mike.

Frank Farquharson, President Elect, took early retirement from CEH at the end of December as part of the major restructuring excercise there. Frank remains associated with Wallingford however, through his appointment as a CEH Fellow, but now also works as a freelance consultant. He has become a director of Water Resource Associates (http://www.watres.com/index.htm), and will continue to work within the field of hydrology and water resources.

As a consequence of her trip to the States for the AGU meeting (see opposite and page 9) **Isabella Bovolo** has become an editor of the new open access journal *Environmental Research Letters* and would like to encourage BHS members to submit a paper!



And finally, the BHS Main Committee welcomes **Gareth Old**, taking over from Ian Littlewood as the CEH representative - see the *President's Piece* on page 3.

The American Geophysical (AGU) Union Fall Meeting

11-15th December 2006, San Francisco

The American Geophysical Union (AGU) fall meeting is held in San Francisco every year, with a second smaller meeting in the spring. There is no doubt it's a huge meeting covering many scientific disciplines (if you fancy a bit of theoretical cosmology then take a break, it's there!) This year, a total of 13032 papers were submitted in various disciplines, with a 1523 papers in the hydrology section alone!

The general format is quick-fire, 12-min presentation slots, quite a few spin-off sessions, technical committee meetings and lunches (Al Gore's lunchtime talk was the 'main event' for this year away from the science sessions). If you want to rapidly disseminate (to normally a large audience) your latest and greatest ideas to our friends across the pond (and wider) then this is the venue for you, but don't expect too much discussion time. Large poster session with 'liquids' served at certain times are the place to get debating.

There is another advantage: choose your hotel wisely, get your San Francisco travel pass for the week and enjoy the concept of travelling to and from the meeting in style on the famous old tram system. Two further tips, bring your travelling wireless laptop (for e-mail) and definitely pre-register for the meeting in time, you'll save a lot of queuing in both cases. Finally there is a traditional pub for hydrologists, it's the *Edinburgh Castle* at 950 Geary and normally one night will be a big meet up. The beer is good and wide ranging and the food is passable at best (fish and soggy chips in newspaper) but it's still traditional to indulge in both whilst meeting up with a lot of colleagues.

This year four people were supported by BHS to attend this meeting — Jim Freer (Lancaster University), Isabella Bovolo (Newcastle University), Naomi Hudson (Birmingham University) and Mark Wilkinson (Newcastle University) — and here are some of our collective experiences, noting that many good research papers were seen that have not been reported (we don't wish to make any enemies!).

Uncertainty, more uncertainty, some certainty and erosion modelling

My main tasks at this meeting were as session convener for 'Uncertainty Assessment in Spatially Distributed Hydrologic Modeling: Strategies, Methods, and Applications' with **Jasper Vrugt** (*Los Alamos National Laboratory*), an invited talk on learning frameworks for erosion models and a poster on phosphorus modelling and uncertainty analysis. The session with Jasper went very well, we had good attendance throughout the session and some great talks. Certainly **Luis Bastidas** (Utah Water Research Laboratory) 'won the day' in our session simply because even he admitted not to fully under-standing the complex graphical output he was showing from their novel research on using Support Vector Machines to explore data errors (I await the paper with interest – could be a tricky read as he kept saying he was avoiding showing all the complex equations behind the techniques!).

In the erosion session (conveners **John Wainwright**, (Sheffield Uni. and **Richard Brazier**, Exeter Uni.) the session was often dominated by WEPP erosion studies with no effective discussion of the uncertainties and limitations in the data or the model predictions (you know those talks with result tables showing 2.256 m^3 of observed sediment yielded for an event!). I got so disillusioned with this I gave up asking questions! – there was however some respite from a good talk from **Tony Parsons** (Sheffield Uni.) – reported below. Luckily, to improve my day I had a great chat afterwards with **Charlie Luce** (US Forest Service), who is one of the few onboard with the difficulties of validating erosion models but has a difficult a battle to get funding in his own institution as the 'lone voice of reason'. I also discussed this issue with **John Selker** (Oregon State University) – John is like Q in James Bond with regard to his search for new technologies to monitor the environment and a very good speaker to catch. He reminded me that WEPP is now being used well away (often in these talks as a physical process model of erosion with additional 'modules' to make it more so) from its initial conception as a mitigation assessment tool for 'unit hillslope' scale predictions. Interesting to think sometimes how things evolve and not necessarily for the best reasons.

Two good talks were given in **Christine Shoemaker**'s (Cornell University) session by Jasper Vrugt and **Brian Tolson** (University of Waterloo). However, as both concentrated on techniques for exploring the parameter space and in particular for finding the 'optimal model', it was like a battle of the optimisers! Perhaps my question 'do we learn much from optimising to a single simulation from an objective function based on R^2 efficiency?' shows we haven't got to grips with this point. Brian in some way 'agreed' as much as noting we still needed to know where in complex parameter spaces our best results could be obtained – a reasonable response and a point that was debated for a while in the session.

Jim Freer

Optical Technologies in Water Quality

As my particular interests are the use of optical techniques in water quality and dissolved organic matter (DOM) composition assessment and dissolved organic matter interactions, particularly in river environments I was keen to attend the poster sessions, lectures and specialist meetings in Hydrology and Biogeochemical sessions.

The Optical Techniques session was personally very relevant with much discussion of the use of specific ultra violet absorbance (SUVA), fluorescence spectroscopy and fluorescence indices in the study of DOM interactions, dynamics and alteration in marine waters, rivers, drinking waters and metal polluted waters. The implications of sample freezing on subsequent optical analysis and standard instrument and sample corrections for standardising measurement across water types and instruments were stressed.

Diane McKnight and **Paula Coble** both commented on the potential for

optical techniques, particularly the implications of climate change on aquatic dissolved organic matter, from elevated CDOM levels to the development of photoproducts. Also addressed were optical techniques for the measurement of biodegradable and non-biodegradable fractions of wastewater, automated and field-based monitoring techniques and DOM characteristics in Northern Forested Watersheds, US. It is clear that there are differences between the US and the UK working groups in the way that fluorescence data, in particular, is processed and presented.

A flying visit to a lecture session 'Carbon cycle and carbon metabolism by microorganisms: genomics, proteomics and isotope signatures' provided an interesting insight into studies of microbial processes, which are a source of DOM in both terrestrial and aquatic waters. Of particular interest was the work of **M. Weintraub** on sub-snow, winter microbial activity and its contribution to the flush of organic- rich water during spring melts, with the proposal that microbial community composition is different during these times to the rest of the year. The session also covered marine issues such as microbial oxidation of methane, microbial population dynamics at hydrocarbon seeps and profiling techniques.

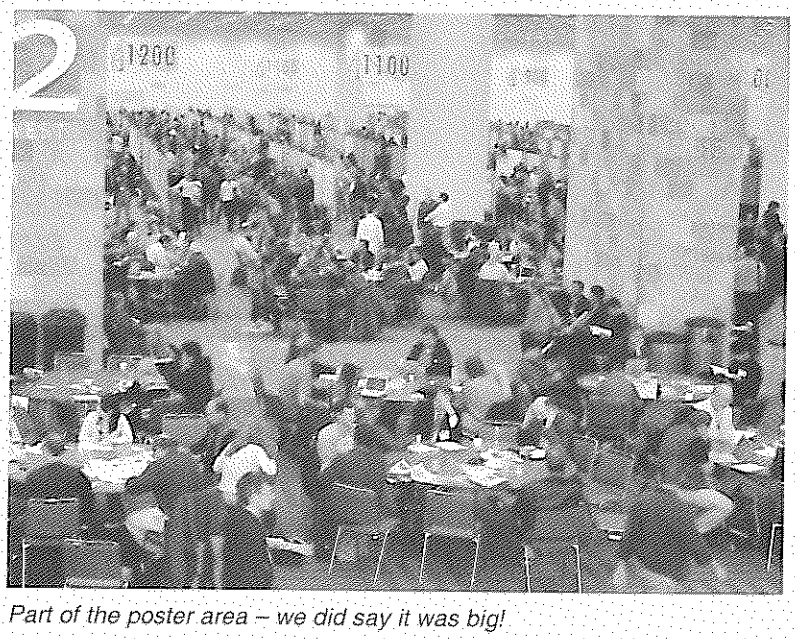
Tuesday afternoon saw a general hydrology poster session "Water Quality of Hydrologic Systems". This session was extremely diverse with an enormous range of general interest subjects addressed by 50+ posters. Areas of interest included groundwater properties and interactions (flow modelling, isotope chemistry, metals interactions and salt water intrusions), modelling of nutrient fluxes in surface waters, water quality monitoring using fluorescence and land use impacts on water quality in specific regions. It was an extremely well attended session which appealed to a wide range of attendees.

Common themes in the session 'Dissolved organic matter: biogeochemistry to hydrology at molecular to catchment scales' included how to develop a DOC budget for peat catchments, DOM sources and land use impacts. Seasonal fluxes in DOM and changes in DOM age, as identified by carbon isotope studies, were discussed, which were interesting and in line with the findings of the microbiological work presented in the Tuesday sessions on the carbon cycle and microbiological processes. The second of these lecture sessions had a stronger technical bent, with in-depth discussion of analytical techniques for investigating DOM sources, character and alteration on catchment and local scales. The poster session for this topic followed on Wednesday afternoon.

On Thursday morning a specialist meeting brought together many of those who work in fluorescence spectroscopy in water applications. It seems that there are large differences in technical application and the way in which data are processed and presented, between those who work in marine and surface waters and between the U.S. and U.K. communities. It was agreed that there would be real benefit from continued discussion and idea-sharing across groups. An invitation by **A. Baker** to the 'Fluoronet' knowledge- transfer events to be held at University of Birmingham over the next year will be a good start. It was agreed that protocols should be developed for data and instrument standardisation, to ensure that studies are comparable and can be related to past and future work.

It was a fascinating conference, and I am grateful for the opportunity to attend, present my work and make a number of interesting contacts supported by a BHS travel grant, at this stage in my academic career.

Naomi Hudson



Isabella Bovolo

Part of the poster area – we did say it was big!

Extreme Hydrometeorological Events

The afternoon began with a stimulating talk from **James Smith** (Princeton University) on extreme rainfall and flooding in urban environments using the Baltimore Ecosystem Study (BES) as a testbed. The BES has been used as a laboratory for examining the coupled hydrometeorological, hydrologic and hydraulic processes that control extreme floods in urban environments. The dense storm drain network in the BES has a strong influence on the hydrologic response of the catchment. The study shows that the drainage network is more important in shaping the flood hydrograph than the expansion of the impervious area. Channel incision and widening along the width the valley bottom constrictions and expansions associated with urban infrastructure exert striking impact on the scale-dependent flood response of urban drainage networks.

The second presentation by **David Kingsmill** (University of Colorado) focused on *'Hydrometeorology Testbeds (HMT) in the American River Basin of Northern California'*. HMT-West targets northern California's flood-vulnerable American River Basin (4740 km^2) on the west slopes of the Sierra Nevada. The goals are: (a) intensively measure the catchment, (b) improve the physical process understanding, (c) test and improve models and — if all the above are good — then (d) improve forecast. The deployment catchment for the study focused on the North Folk Basin (875 km^2) which has a good hydrological record back to 1941. The intensive field campaign started in 2005 and will continue over the next 2–3 winter seasons.

Soni Yatheendradas (University of Arizona) talk was entitled *'Development of a Semi-Arid, Site-Specific Flash Flood Forecasting System for the Western Region: Results, Insight and Way forward'*. He began by highlighting the increasing problem of prolonged dry periods with variable intense precipitation in the Western region of the USA. The outcome of these convective summer events is 'short-fused' flash floods, which often result in risk to life and property. Current NWS flash flood predictions are based either on lumped humid region models or areal rain averages. The KINEROS2 model was modified to make forecasting more site-

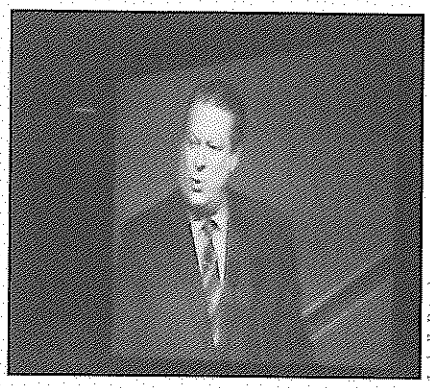
specific.

My contribution to this session followed was *"A multiscale nested experiment for understanding and prediction of high rainfall and flood response spatial behaviour in the Eden catchment, Cumbria, UK"*. A deficiency in current understanding of flood response behaviour is the way in which extremes of rainfall intensity reduce in relation both to the area covered by the storm and to the storm duration. Hydrological data were presented for three major flood events from the Upper Eden catchment, Cumbia (an unusually densely instrumented catchment, part of the CHASM network). Flood response is examined over varying scales. Rainfall undercatch due to high wind speeds has been a problem with estimating rainfall with some of the synoptic events, with some higher elevation raingauges recording lower rainfalls than the nearest lower elevation gauge. A physically-based distributed model (SHETRAN) is currently being used to investigate flood peak response with improved rainfall estimates to highlight how the spatial and the temporal variability of storms are important in flood forecasting.

Attilio Castellarin (University of Bologna) presented *"Probabilistic Envelopes of Extreme Floods for Design-Flood Estimation at Ungauged Sites"* which focused on the development of an algorithm for the application of the empirical estimator of T to real-world datasets and assesses how the selection of a particular cross-correlation formula and plotting position affects the accuracy of design flood estimates retrieved from RECs. The results show that the reliability of REC flood quantiles for ungauged sites is comparable with the reliability of regional estimates produced by the application of the index-flood approach.

Juergen Kropp (Potsdam Institute for Climate Impact Research) focused on *"Towards new ways in flood risk assessment: coping with nonstationarity and correlations"*, developing methods which allow us to cope with these difficulties and quantify these uncertainties systematically. Two strategies were presented, the first introduced the advantages of a non-stationary GEV and how the results for design floods change if trends are occurring. The second was based on a semi-parametric bootstrap approach involving an automated model selection procedure for the autocorrelation function and a resampling strategy from the maxima series of the observations.

One keynote speaker I would like to draw attention to is Al Gore with his speech on Climate change: The role of Science and the Media in



Isabella Bovolo

Al Gore giving his lunchtime talk

Policymaking. A politician's view on how Scientist, governments and the media must link to communicate the issue of climate change to the outside world (presented with lots of hand expressions and passion!).

Mark Wilkinson

Landslides, Debris Flows and More...

I organised a session on modelling, prediction and monitoring of the spatial and temporal distribution of landslides which I convened with **Mario Martina** (University of Bologna).

I presented my own research on shallow landslides, for a 180 km^2 catchment in the Italian Southern Alps. Using the SHETRAN landslide model, I was able to improve existing threshold relationships defining the rainfall conditions (intensity and duration) that trigger shallow landslides, by quantifying the severity of landsliding as a function of rainfall return period. I was also able to show how rainfall patterns of different combinations of intensity and duration affect the timings and locations of landslides events.

The oral session (H54B) was scheduled for 4-6pm Friday afternoon (the last slot in the conference!) and was unexpectedly well attended. As an invited speaker, **William Dietrich** (University of California) opened the session by presenting a new approach to shallow landslide modelling. Bill argued that it is not sufficient to predict when and where landslides occur, but that it is also important to predict the size of failures as this may vary with location and affect slide timing, hazard potential and landslide evolution. He introduced a new stability analysis model which evaluates combinations of hill-slope sectors to find the least stable area and hence the size of the most probable landslide.

The second invited speaker, **Riccardo Rigon** (University of Trento) gave a stimulating talk discussing the philosophy behind a new distributed model, GEOtop-SF. The model uses Richards' equation to compute the 3-D movement of water in unsaturated soils, and an infinite-slope, factor of safety component taking heterogeneous distributions of soil parameters as input. Riccardo highlighted the importance of simultaneously modelling when and where landslides occur as well as modelling processes such as transient perching, infiltration and lateral flows. He also promoted open source software.

Several other talks during the week attracted my attention. **Richard M. Iverson** (University of Virginia) gave the Langbein keynote lecture on 'Shallow flows that shape the Earth's surface'. He showed videos of experimental debris-flow experiments using a 95 m long flume sloping at 60%, designed for researching all stages of the debris-flow process. Richard highlighted the fact that large-scale experiments are required for scale-dependent parameters.

Tony Parsons (Uni. of Sheffield), reminded us of the dangers of using empirically-based equations without a full understanding of their origins or limits of their application. For example, the Marshall-Palmer model (1948) for raindrop size distribution that frequently underpins rainfall intensity-kinetic energy relationships in soil-erosion models, was originally established for low rain rates and has been shown to be inappropriate for the high-intensity rainstorms that cause most soil erosion. In addition, Hudson (1963) stated that the wide variation of drop size distributions within and between storms of similar intensity was most noticeable, particularly at low intensities'. The distribution curves can only show the general trends over large numbers of storms. This uncertainty in the drop-size distribution of rainfall has a significant effect on predicted rates of inter-rill soil erosion. (Jim Freer notes he also brought this up in his talk, and showed examples of work from **Chris Godfrey** (Oklahoma University) using disdrometer measurements which clearly showed the high variability in the relationship between drop size and intensity during storm events).

Isabella Bovolo

Hydrological data

We all know its out there, the problem is - where?

BHS committee asked **Kelvin Limbrick** to look into this and he has compiled an excellent draft spreadsheet on who has got what and the relevant web-site details. We propose to put this up on the BHS site shortly, with the request for feedback on what is missing and ideas for format.

Please do respond so that we can make this a useful reference source.

Drought forecasting – what's needed and what's possible?

BHS National Meeting
ICE, London, 8th February 2007

On a day that saw major disruptions due to snowfall, it seemed somewhat ironic to be talking about drought forecasting. However, the importance of forecasting, the application and comparison of techniques and some of the associated issues were all brought to the Conference. The day saw presentations from the Environment Agency, Water Industry and key Research Institutions.

The welcome and introduction was given by **Rob Grew** (Environment Agency) who drew comparisons between the drought in Australia, 'The Big Dry' and our recent drought event, 'The Little Dry'. Rob highlighted that although the impacts were on very different scales, both events had generated significant media interest. He suggested that if we can forecast these events and their potential impacts then mitigation is easier.

Gwyn Rees (CEH) chaired the first session. **Ian Barker** (Environment Agency) set the day in context with his presentation titled *"Ready for Drought?"* Ian outlined the Environment Agency's role in water resource management, water resource planning and statutory roles in drought planning. Ian reflected on past drought events, highlighting the 1930s and 1970s, which saw severe impacts on industry, the public and the environment. The 2005–6 drought was severe but had minimal impact, the result of good planning and management. Ian stressed the importance of being prepared, forward-looking and always learning.

Ian explained that a good understanding of environmental systems and how they respond to extremes can help ensure we take the right actions and therefore minimise the impact of drought. Knowledge of the way in which people use water is also paramount; implementation of hosepipe bans and increased publicity during summer 2006 led to reductions in demand of up to 15%. The Environment Agency and Water Companies need a full and flexible range of actions as outlined in drought plans to manage events effectively. Feedback from the public has helped refine and improve these plans.

Ian concluded his presentation by noting the main challenges facing forecasters. Firstly, there is a need for more reliable long-range weather forecasts. Secondly, production of hydrological forecasts during non-drought periods enables models to be reviewed and tested. Lastly, more detailed hydrological forecasts will provide better support for risk-based management decisions. The next drought will come and we need to ensure that we implement what we have learned and continually strive to be better prepared.

The discussion following this presentation reiterated that better planning and direct investment, coupled with lessons from previous events, helped minimise the impact of the 2005–6 drought. Another important message was that as we are unable to forecast everything, everywhere, we must target those locations at most risk, both in terms of environmental impact and risk to public water supply.

The second presentation of the morning was given by **Jamie Hannaford** (NRFA, CEH). Jamie began his presentation *"Long term hydrological variability: Implications for forecasting and prediction"* by outlining the main issues associated with the estimation of future conditions: limitations of data, complexity of droughts and whether hydrometric data are representative of historical variability. Jamie's first key message was that although it is easy to detect trends, care must be taken to assess whether they are due to climatic variability or anthropogenic impacts.

Comparisons were drawn between the 2003 drought with its arid spring through to autumn but limited groundwater impact and the 2004–06 drought, a multi-seasonal event that had a major impact on groundwater.

The presentation moved on to look at flows between 1970–2004 in the NRFA benchmark network of natural catchments. There is little evidence for trends in low flows. As this period is relatively short, long-term rainfall records were then examined. Looking at seasonal distribution within England and Wales over the last 200 years, Jamie noted there has generally been an increasing tendency for winter rainfall to exceed summer rainfall. These results are important in terms of drought risk as there is a growing reliance on winter rainfall to sustain groundwater sources; however, the recent drought underlines our continued vulnerability to successive dry winters. It is important that we look at changes in variability in longer records and try to understand influences which may be behind historical perturbations, such as the North Atlantic Oscillation (NAO).

A discussion followed around the reliability of long-term records and the possibility of assigning confidence limits to historical observations. It was agreed that building uncertainty into historical analyses is an area that needs further research.

The final presentation of the morning was given by **Rob Sage** (Veolia Water) and focused on *"Managing the impact of groundwater drought"* from a water company perspective. Veolia Water (Three Valleys Water) has a large supply network and Rob described what the recent drought has meant for them. The supply network was used to move water into stressed areas and hosepipe bans and other restrictions were implemented as a controlled response to the conditions, actions which attracted a lot of publicity. Additional effort was put into leakage control and the monitoring of groundwater and river flows was also increased. 2006 saw a number of licence restrictions activated and additional calls for voluntary restrictions from the Water Company.

Veolia Water convened their drought management group in December 2004 and implemented their drought management plan. They had regular meetings with the Environment Agency, Natural England, other Water Companies and

local interest groups. Together they focused on increasing public awareness and giving a consistent message about how to conserve water.

Modelling and hydrograph analysis has played an important role in drought management. Work has been undertaken using three rainfall scenarios and the use of high, medium and low risk categories. Rob highlighted that risk-based management presents many challenges as the weather dictates demand patterns. As a result it is not known what will happen to demand this summer. Veolia Water will continue with aim of making people more 'water aware'.

Murray Dale (Halcrow) chaired the second session. **Richard Graham** (Met Office) commenced with *'Long range rainfall prediction: current and future prospects'*, focusing on how the Met Office incorporate the main driving factors of inter-annual variability (chaos and large-scale influences) into seasonal forecasts.

Richard first introduced GloSea, a dynamical prediction model used by the Met office for both real-time and retrospective forecasts. Initial sea-surface conditions are varied within ensemble runs to include uncertainty caused by chaos in the climate system. The skill of the forecasters is in interpreting Relative Operating Characteristics (ROC) scores, shown to vary annually with the strength of climate forcing.

Richard went on to outline how statistical methods are used to account for large-scale climate influences in forecasts. For example, it is possible to calculate the probability of the winter NAO sign from May sea-surface temperatures; this is a climate phenomena that can be related to UK winter rainfall. It was shown that, in general, skill in long-lead precipitation forecasting is low but that in years with strong NAO forcing, this skill can be improved.

Winter forecasting can also be improved when both methods are objectively combined using the linear discriminant method. Associated work with the Environment Agency Thames Region used the combined methods to develop regional probability forecasts of seasonal precipitation; the continuing aim is to improve skill in forecasts downscaled to UK climate districts.

Rob Wilby (Environment Agency) presented his work on *'Experimental seasonal rainfall forecasts for the River Medway, Kent'* in which he considered two straightforward approaches to forecasting that use readily available data.

Rob looked initially at the 'naive model' which considers the frequency and length of droughts in a historical context using the number of consecutive dry seasons. Within the 150-year Medway catchment rainfall record it was found that the longest dry sequence was 10 consecutive, 6-month seasons. It was also noted that over this time dry sequences have become less persistent, a pattern that is consistent with projected climate change.

To further understand extended dry periods in a historical context, the Markov model was used to assess return periods; a four-season dry sequence, comparable with the 04–06 drought, was shown to have a return period of 14 years, indicating that a drought of this nature is not that unusual.

The second approach described, the 'conditional model', uses seasonal outlooks through lagged predictors to produce long-lead probability forecasts. Statistical relationships between seasonal rainfall in the River Medway catchment and a number of climate indices were analysed. This showed that modest prediction of catchment summer rainfall using winter NAO as a lagged predictor could produce the correct sign (i.e. above or below average) three out of four years. However, confidence in prediction of rainfall in other seasons was low.

A short discussion followed, supporting the use of long-term records to provide benchmarks for current conditions to be put into a historical context. The need for confidence levels were agreed and led to a discussion around low confidence levels and their usefulness. A comparison was drawn with flood forecasting; if confidence is low but consequence high, low probability forecasts could still be useful.

Trevor Bishop (Environment Agency) chaired the final session of the day. **Richard Davis** and **Nigel Hoad** (Environment Agency) presented *'An ear to the ground and an eye for the future' – groundwater scenario forecasting in the chalk of southern England during the 2004–06 drought'*. During the recent drought, groundwater level forecasts were needed to assess potential environmental impacts and assist with water company planning. The Environment Agency adopted a twin-track approach using two complementary models. Richard introduced the first, CATCHMOD, an in-house rainfall-runoff model. It is assumed that the volume of the lower store within the model is proportional to aquifer storage; therefore CATCHMOD can be used to generate naturalised groundwater levels at key sites across the south-east. Good calibration was achieved with historical sequences and this provided a sound base for a scenario-based forecasting approach that produced some good results.

Nigel described three MODFLOW models used to generate catchment wide groundwater levels. Model outputs for a range of rainfall scenarios were variable when compared with observed values. However, the spatial and temporal output of river flows within MODFLOW makes it a valuable tool for assessing potential environmental impacts, as it can indicate which wetlands and river reaches could be affected significantly as groundwater levels fall.

In finishing, Nigel stated that for models to remain relevant within risk-based management they need to be updated regularly with good data, and objectives put in place to ensure that they continue to be appropriate for the user's needs.

John Bloomfield and **Michael Cheetham** (BGS) gave the final talk *'Forecasting groundwater droughts'*. The aim of their research was to predict groundwater minimum levels a season in advance using a relatively simple approach. Two different methods were investigated using three chalk boreholes with varying characteristics, Stonor in the Chilterns, Rockley in the Marlborough Downs and St Peter's Church in Brighton.

John introduced the first method, the use of linear regression relationships to predict groundwater minima using independent variables. 90% of annual minima variation could be explained at Stonor in comparison with only 56% at St Peter's Church. This indicates that it is possible for a linear model to explain variation in minima under some conditions, even when non-linear processes are in operation.

Mike went on to demonstrate a neural network model used to trial a non-linear method. The network is trained using an iterative approach to match training datasets before being used to forecast groundwater level timeseries from separate input data. Using this technique the prediction of minima from preceding maxima was unsuccessful as the model was unable to generalise once the training data were removed. Prediction of maxima from preceding minima appeared more successful although it is not yet understood why.

The variable success of both methods is mainly due to the constraining factors of data quality and site-specific, geological and anthropogenic controls that have significant impacts on chalk hydrographs. Mike suggested that further work is required to increase understanding of controls on groundwater minima before modelling studies can progress.

The day concluded with an interesting discussion session on the use of groundwater models in

drought forecasting. In terms of future developments, Richard Davis stated that the Environment Agency intend to link their CATCHMOD-generated scenarios with outputs from the Met Office and Rob Wilby's work and possibly look to feed radar-based data into the models. It was asked if it is possible to run both CATCHMOD and MODFLOW more quickly in the future. In response, Richard stated that the Environment Agency are building the methodologies into their operational procedures and guidance for drought management. The difference between the Environment Agency estimates of source output data and regional model forecasts was highlighted. In response, Nigel Hoad stressed that there is a need to understand the constraints and limitations relating to the models themselves. The discussion moved onto priorities; it was noted that the threat to public supply carries more weight as a priority and has led attention during the recent drought event. A key point from the discussion was about managing risk; forecasts can be wrong as there are dynamics we can not predict and therefore it should be remembered that model results should only be used as a tool alongside expert judgement.

Kate Riley and Sarah Jones
Environment Agency

Current issues in hydrometry

Pennines Hydrological Group Meeting
United Utilities, Lingley Mere, Warrington
21st February 2007

62 people attended this popular meeting. Janet Bromley (United Utilities and Pennines Group Chairman) began the proceedings by welcoming everyone and inviting ideas for subsequent meetings.

Challenges facing hydrometric monitoring in the Environment Agency

Rod Furnell (Environment Agency) gave the first presentation. He explained that the Agency currently operates 15 500 hydrometric monitoring sites across England and Wales. These record precipitation, water level and flow. He outlined some of the main challenges resulting from the Water Framework Directive (WFD), the National Audit Office (NAO) review of Water Resource Management, and the EA's future financial outlook. Up to 25% of the EA's flow monitoring structures may pose a problem for fish passage, an important consideration in assessment of good ecological status for WFD. The EA is researching fish passage solutions that minimise impact on flow measurement quality.

In response to the NAO, the EA is undertaking a review of its hydrometric networks looking at current and future needs, exploring more risk-based approaches to its hydrometric field activities and investigating how technology can further reduce the need to visit monitoring sites. This work is consistent with the future financial pressures on the EA, requiring significant efficiency and effectiveness improvements to deliver *"More, Better, Faster for Less"*.

A question was raised about how the EA will update end-of-life stations. Rod replied that it would be done on a case by case basis following the NAO principles of assessing service, efficiency, cost and risk.

Using hydrometry to manage water resources at United Utilities

Kelly Rains (United Utilities) discussed the practical issues in hydrometry facing the water company and how hydrometric data are used to manage the water supply network in North West England.

Kelly defined the data needed for various tasks. These include the use of rainfall and reservoir levels in water resource modelling and planning, water levels and flow to monitor abstraction, and compensation flows to ensure compliance with regulatory requirements.

Kelly completed her presentation by assessing the problems UU encounter in collecting hydrometric data, such as availability of power supplies, weed growth, mobile channels, fish migration, waste disposal and vandalism.

Flooding: are you certain?

Stewart Child's (Hydro-Logic Ltd) presentation explored the determination of extreme flood events to an acceptable level of uncertainty.

Stewart began by discussing rating extension with the suggestion that hybrid techniques, such as modelling alongside new acoustic technology, can prove more useful. Stewart went on to discuss stage-fall discharge methods, adjustments for non-modular flow, acoustic technologies and velocity index-rating methods, assessing the uncertainty involved with each method.

Finally Stewart discussed low flow determination and suggested that the uncertainty is similar to that of high flows. He also directed us towards CEN ISO/TS 25377:2007 which is a guide to uncertainty due to be published later this year. The presentation ended with a question regarding whether horizontal ADCPs or transit time ultrasonic devices were best to use. Stewart replied that there is a place for both but the ADCP is easier to install and is less power-hungry than transit time ultrasonic devices.

Performance of tipping bucket raingauges

Dr **Maxine Zaidman** (JBA Consulting Engineers and Scientists) explained that the EA currently operates 1200 TBRs which are regularly visited, maintained and outputs compared with a manual check gauge. If at this stage there is a significant discrepancy, re-calibration occurs.

In 2005 the EA approached JBA to assess the overall performance of its TBR network. JBA looked at 626 sites across England and Wales, comparing over 29 000 TBR/check gauge monthly totals for 2000 to 2004. Overall, the study showed that totals for about 20% of the comparisons were slightly out of sync, although this included false zeros due to power failure or damage. Blockage of TBR funnels was also significant.

Maxine found that the TBRs had a slight tendency to undercatch compared to the check gauges, particular during periods of high rainfall (suggesting problems with TBR measurement during intense rainfall). A strong seasonal effect was also evident, with TBRs recording more rainfall than daily read gauges in the warmer summer months due to evaporation.

There was a question on whether it would be better to use dual TBRs rather than a TBR and a manual check gauge. Maxine replied that this would probably be better for data quality as the TBRs would be affected in similar ways. She also suggested that even though there is a large initial capital cost, there would be less ongoing resource costs and therefore it may be worth considering further.

Use of spatial information to optimise hydrometric networks

Cedric Laize (Centre for Ecology and Hydrology) stated that the National River Flow Archive (NRFA) had recently developed two indices that assess the strategic value of individual gauged catchments independently from the performance of the associated gauging station. The Representative Catchment Index (RCI) quantifies how representative a catchment is of a specified area in relation to a selection of spatial characteristics. The Catchment Utility Index (CUI) examines the influence of individual catchments in the context of a regionalisation methodology used for flood estimation.

Cedric then demonstrated two case studies. The first catchment was the Dulas at Rhos-y-Pentref which has difficult access, gravel build-up and is mainly grassland. It is supported by the RCI as it is highly representative of upland England. The second case study was on the River Thames at the Royal Park, Windsor. The RCI showed it is the eleventh most representative catchment for lowland England (<200 m); its CUI is the second highest for large catchments (>1000 km^2). It is hoped that this new procedure can be used to identify preferred locations for future gauging stations.

Cedric was asked whether the CUI will ever look at low flows and he replied that in the future CEH will look at the indices for use with low flows and a combination of both will probably be used to assess the value of gauging stations.

Issues with monitoring large storm events in the Upper Eden catchment, Cumbria

Mark Wilkinson (University of Newcastle upon Tyne) gave the final presentation of the day. The Upper Eden catchment has a dense upland hydrometric network (part of the CHASM network). It currently has 31 TBRs, 11 stage gauging stations and 4 weather stations over a 616 km^2 catchment. Over the last three years there have been five substantial rainfall events resulting in flooding.

The data from these events have shown an erroneous pattern, with runoff exceeding rainfall amounts for the upland catchment. This is probably due to the exposure to wind causing undercatch in the raingauges. Mark explained that recently other antecedent conditions have been examined by installing peizometers on the flood plains which can give an indication of the depth of water during inundation. Theta probes have also been used on a wide scale to demonstrate soil moisture variability over small areas. Finally, equipment for water quality and suspended solids monitoring has been installed. All these data are being used within SHETRAN, a spatially distributed system for modelling surface and subsurface flow.

Mark explained that in the future they wish to install pit raingauges to minimise undercatch and also extend the study to mountainous and arable catchments. Mark was asked if they had assessed the extra calibration needs of a TBR used to measure high intensity rainfall. He replied that he is aware of the issue but at this stage they are only aiming to get an estimate of rainfall. Should the need for improved data arise, this would be something to look into.

The meeting was closed by Rod Hawnt (BHS President) with a big thank-you to all those who took part and to United Utilities for hosting the event.

Laura England
Environment Agency

Exploring the social impacts of flooding and flood risk in Scotland

Scottish Hydrological Group meeting
Royal Society of Edinburgh
6th December, 2006

Alan Werritty, Donald Houston and Tom Ball (School of Social Sciences-Geography, University of Dundee) presented a very well co-ordinated and informative summary of their recent study of the social impacts of flooding and flood risk in Scotland to an audience of over 60 people at the Royal Society of Edinburgh.

The study was commissioned by the Scottish Executive and is the first systematic investigation of these issues in Scotland. The objectives of the study were twofold. Firstly, to assess the range of impacts that experience of recent flooding in Scotland has had on people and their attitudes and behaviour; and secondly, to provide insight for policy and practice with respect to flooding.

A range of methods was employed in the study. Surveys were conducted of households that had and had not experienced recent flooding in eight areas across Scotland, ranging from Hawick in the Borders (flooded in 2005) to Elgin in north-east Scotland (flooded in 1997, 2002) and Glasgow (flooded in 2002). Geodemographic profiling showed that the survey areas were generally representative of urban Scotland in terms of factors such as income and age. The survey was conducted in the form of a hand-delivered questionnaire which was collected later the same day or on the next day, thereby ensuring a high response rate of >50%. In total, survey responses were obtained for 633 flooded and 590 non-flooded households. Focus groups were also held in selected communities from the areas in which the household surveys were conducted. Finally interviews were conducted with key institutional stakeholders who manage flood risk locally and across Scotland, such as local authorities, SEPA staff involved with flood warning, the Scottish Executive and the insurance industry.

The study revealed a number of interesting and important results. From the household survey the intangible impacts of flooding exceeded the tangible economic impacts, mainly because insurance met the immediate economic costs

incurred. The main impacts of flooding identified by the respondents were the time and effort required getting the house back to normal and the discomfort and inconvenience endured during this time. The impacts of flooding were greater for lower income households (annual income below £20,000). Flood warnings were valued and people who had received a flood warning were more likely to have taken action. However, receiving a flood warning had little or no effect on the severity of impacts from flooding. Households that had been flooded had a very low level of confidence in receiving sufficient warning of a future flood. Worryingly, the survey revealed low levels of personal ownership for managing flood risk. Most respondents thought that responsibility should lie with institutions, especially local authorities and the Scottish Executive. The stakeholder interviews identified many examples of very good best practice in individual local authorities with respect to managing flood risk that should be disseminated more widely. The interviews also identified the need for greater community engagement in managing flood risk. For example, the experience of local authorities is that promotion of flood alleviation schemes is most successful when the public have been involved from the earliest stage.

The talk stimulated many questions relating to the study. The survey areas were selected to represent different types of flooding (e.g. pluvial, coastal) and recent floods that have occurred predominantly in eastern Scotland. The majority of households that had been flooded realised beforehand that their property was at risk of flooding but often this was only identified during the final stages of property purchase when the purchaser was reluctant to withdraw. There was also a general presumption that the local authority or the Scottish Executive was responsible for providing flood protection. There was no evidence of blight as the result of flooding in the communities that had been flooded and any impacts on house prices or ability to sell property were short-lived. The study had not investigated the impacts of flooding on businesses. At the moment the cost-benefit analysis of proposed flood alleviation in Scotland does not take account of the social impacts of flooding, although in England and Wales weightings are applied that take some account of potential social impacts. Insurance is important for mediating the economic tangible impacts of flooding, but it may be less widely available in the future and thus the tangible impacts may become more important.

Further details of the study will be available in the final report that will be published by the Scottish Executive in early 2007.

Kate Heal
University of Edinburgh

Carbon in peatlands: state-of-the-art and future research

'PeatNet' conference
Wageningen, The Netherlands
15–18 April 2007

This conference was organised as part of *PeatNet*, an international collaboration of researchers involved with northern peatland ecosystems (http://www.peatnet.siu.edu/index.html). The PeatNet network aims to advance understanding of how climate change and human/natural disturbances affect these ecosystems in the past, present, and future.

The talks were divided into biogeochemistry, microbial ecology, plant ecology, ecohydrology, ecosystem and landscape ecology, palaeoecology, and finally peatlands and climate-modelling and larger spatial scale assessments. **Christian Blodau** (Bayreuth, Germany) began with a talk on biogeochemistry and the carbon cycle and in the afternoon **Chris Freeman** (Bangor, UK) introduced the microbial ecology session with his talk on the role of phenol oxidase in regulating peatland carbon cycling.

The second day began with the ecohydrology session and a talk on peatland hydrology and the secret carbon flux by **Joseph Holden** (Leeds, UK). The ecosystem and landscape ecology session spanned the second and third day and was introduced by **Nigel Roulet** (McGill, Montreal) who talked about ecosystem level carbon dynamics of northern peatlands: what do the measurements and models tell us? On the final day the paleoecology session began with a talk on raised bogs as archives of climate change by **Bas van Geel** (Amsterdam, Netherlands) and the conference concluded with the peatlands and climate session with **Pep Canadell** (CISRO, Australia) talking about the vulnerability of the carbon cycle, the role of peatlands, and impacts on climate change.

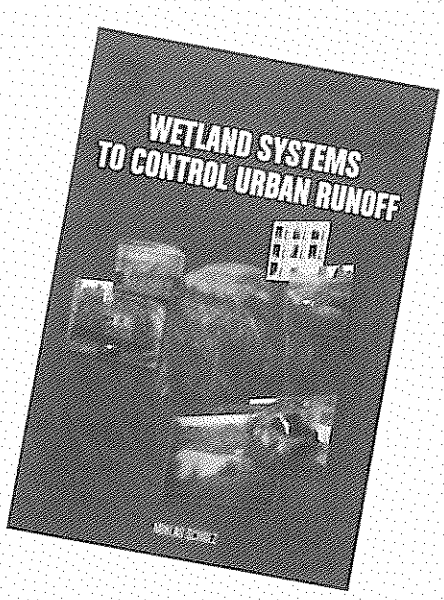
The interactive poster sessions were as extensive and varied as the oral presentations and promoted much discussion about the various aspects of carbon and peatlands. The conference dinner was a spectacular meal held in the Hotel de Wereld. This historic location was where, in 1945, the German General Blaskowitz surrended to the Canadian General Foulkes, ending the Second World War in the Netherlands.

The final day took the delegates out of the conference hall to Nieuwkoopse Plassen and Keukenhof. The Nieuwkoopse Plassen are a complex of shallow lakes formed post peat harvesting in the 16th century and narrow strips of land where the peat was left to dry after extraction. Keukenhof is the world's largest flower garden and is known as the Garden of Europe: last autumn a massive 7 million bulbs were planted!

All in all this was a fantastic well-organised conference which focused on important and increasingly topical research. It facilitated the meeting of scientists with similar and complementary research areas. The relatively narrow focus yet large number of delegates and single session format meant that the delegates benefited from a broad array of research projects focussing on peatlands and carbon. Thanks very much to the conference organisation team and hopefully there will be another PeatNet symposium soon!

Alona Armstrong

Wetland systems to control runoff



Joint SHG and IEMA meeting
The University of Edinburgh
28 February 2007

Dr Miklas Scholz began by reviewing various novel wetland systems to control runoff before summarising the main findings of his book *Wetland Systems to Control Urban Runoff* (Elsevier, 2006).

Reed beds provide a useful complement to traditional sewage treatment systems. They are often a cheap alternative to expensive wastewater treatment technologies such as trickling filters and activated sludge processes. Vertical-flow and horizontal-flow wetlands based on soil, sand and/or gravel are used to treat domestic and industrial wastewater. They are also applied for passive treatment of diffuse pollution including mine drainage as well as urban and motorway runoff after storm events.

Dr Scholz provided good examples on how to integrate natural and constructed wetlands, and sustainable drainage techniques into traditional water and wastewater systems used to treat surface runoff and associated diffuse pollution. He also reviewed preliminary and predominantly primary treatment units that can be combined with wetland systems, and summarized predominantly secondary but also tertiary treatment technologies that can be used in combination with wetland technologies or as alternatives in cases where land availability is restricted.

The focus of the presentation was on current research case studies related to constructed wetlands and associated technologies for runoff and diffuse pollution treatment. Dr Scholz's book is aimed at professional hydrologists and environmental managers but also students interested in design, process and management details.

The audience learned that semi-natural and constructed wetlands can be combined with traditional water, wastewater and storm water treatment technologies and systems, and with various sustainable drainage techniques and trains. Wetland systems are efficient in treating contaminated stream water, roof and road runoff, and diffuse pollution. Moreover, they often enhance the ecological habitat value of a site.

It was surprising to hear that the role of advanced filter media and macrophytes is frequently insignificant with respect to the treatment performance of wetland systems. However, active biomass is predominantly responsible for biochemical oxygen demand and suspended solids removal. Treatment wetland performance can be modelled successfully with traditional and even better with novel modelling techniques such as neural networks.

Henry Collin
Institute for Environmental Management and Assessment

David Martin
Scottish Hydrological Group

A new knowledge transfer network

A new NERC-funded network focusing on groundwater–surface water interactions and hyporheic zone processes has been set up to improve dissemination of research results on this important topic and to aid its use in regulatory, management and policy decision-making processes. It provides a forum for presentation and discussion of new research, and will also allow the science end-user community to communicate priorities for future research to academics.

This **Hyporheic Network** is run by a team from the universities of Sheffield, Lancaster and Birmingham, and from CEH and the Environment Agency.

Specific objectives are to:

- establish and maintain a forum on groundwater / surface water (GW-SW) interactions and hyporheic zone processes to attract and engage scientists and science end-users, including researchers from a wide range of scientific disciplines;
- promote and disseminate research on GW-SW interactions and hyporheic processes through a series of workshops and symposia, and by a web-based portal;
- publish a handbook on GW-SW interactions and the hyporheic zone, focussing on environmental management of hyporheic chemistry, ecology (including microbial ecology) and flow. The handbook will synthesise cutting-edge science for river managers;
- stimulate novel research proposals that address priority end-user problems by building new interdisciplinary research teams;
- identify emerging research and provide a forum to influence future policy and legislative development;
- encourage discussion and collaboration between young and more experienced researchers, including the active participation of young researchers, including PhD students, by supporting their attendance at network meetings.

The **first workshop will be held in Sheffield on 11 and 12 June** 2007. Further details are available on the Network website. All those interested in this subject are invited to join the network and participate in the workshops. Further details can be found at the Hyporheic Network website: www.hyporheic.net

Scottish Hydrological Group update

For those who are not familiar with the Group, the aim of the SHG is to encourage and advance the study of hydrology in Scotland by holding meetings for the discussion of papers on hydrological subjects. The SHG typically host six or seven meetings throughout the year, mainly on an evening in Glasgow or Edinburgh. During 2006–2007, meeting topics ranged from hydrometric developments in Scotland, exploring the social impacts of flooding and flood risk, fluvial geomorphological studies and the development of a flood forecasting system in South West Scotland.

A draft programme is currently being developed that includes meetings on abstraction pressures on groundwater, modelling climate change and riverflows, coastal flooding in Scotland, delivering the CAR's regulation and flood management issues in the Ness catchment.

Membership of the SHG is free and open to anyone with an interest in hydrology. If you would like to sign up to receive notifications of forthcoming meetings then please contact Manuela Toth, our new Secretary. Manuela is a Senior Hydrologist with Arup Scotland and has been involved with the SHG Committee for a number of years. Manuela takes over the Honorary Secretary responsibilities from April 2007 and can be contacted on Manuela.Toth@arup.com or 0141 3527881.

Following our AGM Duncan Wishart of Jacobs gave a talk on *Fluvial Geomorphology for EIA and Flood Defence Work*. Duncan introduced the audience to the general principles of fluvial geomorphology and discussed a number of recent case studies.

The programme of events for 2007-08 is now well advanced. It includes evening events on *characterising groundwater pressures, modelling climate changfe and river flows, coastal flooding, delivering the Controlled Activities Regulations* and a half-day meetimng in Inverness on the Ness flood alleviation scheme. In addition, there will be a joint SHG/SHSG evening event focussed on post graduate research in hydrology and hydraulics.

Michael Cranston

How do I become a hydrologist? Can you help me gain some work experience as a hydrologist?

Two good questions that BHS is asked by aspiring hydrologists. Work experience is extremely valuable for hydrologists and their employers, and is something that BHS is keen to promote. Following a good response to a request for volunteers, **Tim Norton**, BHS Young Members Rep, has compiled a list of BHS members who may be able to provide work experience. These contacts are throughout (and occasionally beyond) the UK, with a wide range of hydrological work. Anyone who contacts BHS asking about work experience will be put in touch with a relevant contact. All opportunities are dependent on the good will of members and their employers, and therefore the list will not be advertised. For further details, or to add your name/organisation to the list, please contact Tim (tim.norton@environment-agency.gov.uk).

News from the South West Section

The section meeting on ***Water Resources in the South West*** was successfully run at the University of Exeter 2:00-5:00 on 21 March 2007. There were about 60 attendees (about equal numbers from BHS and CIWEM). The topics attracted the attention of the audience and promoted some interesting discussions. The PowerPoint files of the talks will be placed on BHS SW web site.

It has been decided to run our future meetings jointly with CIWEM to reach out to a maximum audience.

The committee has also decided to actively seek sponsorships for our future seminar meetings to cover the catering, to keep the meetings free to attract student attendees and travel expenses of self-financed speakers. Halcrow and Atkins have agreed to sponsor two of the meetings already, an excellent start!

Dawei Han

Diary

23rd May 2007
BHS Joint seminar with other groups
"Sustainable communties"
Venue: Centre of Life, Newcastle
Contact: Kate Palmer
email: Kate.Palemer@newcastle.ac.uk

5th June 2007
BHS National meeting
"How can we trust models? "
Venue: CEH Wallingford
Contact: Gareth Old, CEH *(tel 01491 692486, email gho@ceh.ac.uk)*

20th June 2007
BHS South West Section joint meeting with CIWEM
"Operational flood forecasting"
Venue: 1.15 Queens Building, Bristol University
Contact: Oliver Pollard
email:oliver.pollard@environment-agency.gov.uk

28th – 29th June 2007
Peter Wolf Young Hydrologists Symposium — conference & field visits
Venue: Newcastle University
Contact: Mark Wilkinson *(tel 0191 222 8599, email m.e.wilkinson@ncl.ac.uk)*

1st July 2007
5th Interceltic Hydrology Colloquium
Venue: Dundee, Scotland
Contact: Alan Werrity *(tel 01382 385084,*
email a.werrity@dundee.ac.uk) or Andrew Black *(a.z.black@dundee.ac.uk)*

2nd – 13th July 2007
XXIVth IUGG General Assembly
"Earth: our changing planet" including an IAHS scientific programme
Venue: Perugia, Italy
See *http://www.iugg2007perugia.it* and *http://www.iahs.info.*

4th July 2007
BHS South East Section meeting
"Water resources in the South East" — lunch followed by a site visit to Bewl Water reservoir in the High Weald

Time for change

Circulation has looked the same since the very first issue back in the '80s. We've become a bit more professional over the years and can do some fancy things with graphics but have stuck with the same format. Using the fact that we now have over a 1000 members (well we had to pick on some excuse), we feel it is time to change.

But it's not going to be just changing typefaces (that's easy!) but also size and colour. There's a new logo coming, to be launched with the next issue. There's also the fact that changes in postal charges make it more sensible to go to A5 size. And then there's the issue of more eco-friendly paper. All in all, dear readers, you may be in for a gentle shock.....

Ed.