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THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

Circulation

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Come to Durham! Register by 10 August for discount

Chartered Hydrologist — is it what you want?

Rod Hawnt's President's Piece seeks members' views

As I near the end of my first year in office, I am pleased that there are significant developments to report on improving routes to chartered status for hydrologists. Following the National Meeting at Imperial College last February, organised by **Neil McIntyre** and reported in the last issue, the Training and Membership sub-committee, chaired by **Peter Ede**, has made substantial progress in identifying the various routes to chartered status and corporate membership.

There is now a lot of information published on the BHS web-site and this has been designed to help guide members through the maze of various options and institutions that offer professional development schemes.

The discussion at the end of the February meeting, plus subsequent feedback from venerable members such as **John Mosedale** — see *Letter to the Editor* and my (much shortened) reply below — indicate that what many members really aspire to is to be able to use the title 'Chartered Hydrologist'. However, this is not at all straightforward, and in fact will be quite difficult for BHS to attain. Chartered status for any professional body can only be achieved as a result of a successful application to the Privy Council. In order to submit an application that stands any chance of success, BHS will have to gain the backing of a government minister (probably from Defra), and will also need to be supported by the UK's single largest employer of hydrologists, the Environment Agency.

I personally believe that this is achievable, but it will require a lot of hard work, and significant costs will need to be incurred if we follow this path. The Main Committee would like to try, but only once we have confirmed that there is a high level of support from BHS members.

Initial discussions with the key managers of the Institution of Civil Engineers have confirmed that this process could take several years. For comparison, the Privy Council took 4-5 years to approve the Chartered

Environmentalist professional status before ICE, CIWEM and IWO could offer this route to their members.

Do BHS members really want their own Chartered title, e.g. CHydrol? Are existing options, such as CEng, CSci and CEnv or even AMICE, really not considered sufficient to satisfy the career and professional development aspirations of most hydrologists? Will employers, and indeed society in general, value a Chartered Hydrologist more than a similarly qualified individual working as a hydrologist but with a title such as Chartered Environmentalist? We need to know the answers to these questions before we can proceed.

So the mini-questionnaire included with this issue of *Circulation* will help the Main Committee to identify the real demand for Chartered Hydrologist status. I would urge all members to complete this so that we can assess the viability of making an application to the Privy Council. The more positive responses we get the stronger the case will be, so please return the printed form or submit the form on-line at the BHS website (*www.hydrology.org.uk/hydrological_issues.htm*).

I would like to be in a position to report back to members on the initial response at next month's AGM, which will take place at ***14.15*** on ***Tuesday 12th September***, during the 9th National Hydrology Symposium in the splendour of Durham Castle and University, so please complete and return the form by post or on-line by 31st August.

Speaking of Durham, you only have until 10th August to claim your early-booking discount for your place at the BHS Hydrology Symposium, which runs from Sunday evening, 10th September, to lunchtime on Wednesday 13th September.

Durham Castle is part of a World Heritage site and an ideal setting for hydrologists to congregate, being dramatically located high above the banks of the River Wear. **Professor Tim Burt** and his local organising committee have laid on an excellent programme of presentations, poster sessions, a small exhibition and an optional field trip to the north Pennines on the Wednesday afternoon.

Star attractions, other than the symposium dinner set in the castle's medieval banqueting hall, include such eminent keynote speakers as **Enda O'Connell** and **Hayley Fowler** (Newcastle), **Chris Spray** (SEPA) and **Louise Heathwaite** (Lancaster). We are also very fortunate that **Professor Jeff McDonnell** (Oregon State University) has agreed to cross the Atlantic to deliver the prestigious Penman lecture on *"Runoff generation in gauged and ungauged watersheds: status and future"*.

So I expect to see many of you at Durham, with the hope that most of you will not be distracted from coming by an excessive workload associated with either low flows and/or flood management issues, as either the drought deepens even further, or it suddenly breaks under a deluge, possibly even both at the same time! Have hydrologists ever been in greater demand than they are now?

Rod Hawnt

New members

A warm welcome to the following new members of the Society. We hope you will play an active part at local and/or national level, and contribute occasionally to *Circulation*. We always welcome news and views from members.

Luke Ballantyne ..... Arup, Leeds
Marty Barnfield ..... Environment Agency, Bodmin
Elinor Benton ..... Environment Agency, Winchester
Dr Wouter Buytaert ..... Lancaster University
Rory D Callan ..... Environment Agency, Warrington
Bethan J Davies ..... Environment Agency, Winchester
Edward A Dimmock ..... Environment Agency, Camberley
Fiona Dow ..... JBA Consulting, Edinburgh
Nick Everard ..... Environment Agency, Wallingford
Dr Ulrike Feistel ..... Mott MacDonald, Cambridge
Annabelle Foot ..... Environment Agency, Peterborough
Natalie S Gledhill ..... Environment Agency, Winchester
Gerard Hawley ..... Penny Anderson Associates Ltd, Buxton, Derbyshire
Richard Holland ..... Environment Agency, Camberley
Rachel L Huitson ..... JBA Consulting, Atherstone, Warwick
Matthew Ince ..... Mott Macdonald, Exeter
Dr Sunil K Kansakar ..... Environment Agency, Warrington
Andrew R Keen ..... Penny Anderson Associates Ltd, Buxton, Derbyshire
Duncan Kitts ..... University of Southampton
Senthuran Longanathan ..... Glory Electrical Ltd, Leatherhead, Surrey
Suzanne D Long ..... Environment Agency, Bodmin
Brian Leigh ..... Environment Agency, Leeds
David I Longster ..... Environment Agency, Winchester
Dr Andrew Lowe ..... Halcrow Group Ltd, Handforth, Cheshire
Morag MacLachlan ..... Scottish Environment Protection Agency, Edinburgh
Chris McKenna ..... Environment Agency, Winchester
Rami Malki ..... Cardiff University
Clare E Manning ..... Environment Agency, Winchester
Karen Mitchell ..... Environment Agency, Exeter
Catherine L Muller ..... University of Birmingham
Alireza Nazemi ..... University of Birmingham
Colin C Pickett ..... Environment Agency, Winchester
Wasim Quasem ..... Atkins Water, Peterborough
Andrew M Roberts ..... Environment Agency, Winchester
Jennie Robinson ..... British Waterways, Hatton, Warwickshire
Dr Lucy Rushmer ..... Jacobs Babtie, Leeds
Richard Severn ..... Environment Agency, Nottingham
Lucy Shuker ..... Atkins Water, London
Jackie Spencer ..... Hydro-Logic Ltd, Bromyard, Herefordshire
Frances Southgate ..... Sussex Water, Henfield, West Sussex
Julie L Thacker ..... Environment Agency, Birmingham
Richard J Westcott ..... Environment Agency, Tonbridge, Kent

Letter to the editor — Chartered Hydrologist

Dear John

I've followed the debate on chartered status over the past 30 years, and the recent review.

I attended, as a young post-grad, the formal opening of the Institute of Hydrology's offices at Wallingford. The great and mighty were present. The question was put: "Now we have an Institute of Hydrology, is it now time to have an Institution of Hydrologists." A shuffling amongst the assembly was followed by: "The Institution [of Civil Engineers] has always catered quite adequately for hydrologists and I don't see any reason for change now." A muffled "Hear, hear" put an end to no debate at all.

Despite those assurances, over 30 years later, the Institution [of Civil Engineers] is as welcoming to hydrologists now as it was then, and

fails hydrologists as much as it did then. Recently a senior group of Chartered Engineers considered that anyone half technically competent in matters hydrological, but not engineers, must be "geographers", and an inferred sneer.

Let's face facts: Civils don't really want us. Providing the administrative services and allowing us to be an Associated Society does nothing to help the professional status sought by Hydrologists: never did, never will.

Hydrologists might affiliate with, but are not, meteorologists. For some reasons geographers are not taken seriously by anyone but geographers. CIWEM has always had a broader base, but does not recognise hydrologists as hydrologists. Indeed CIWEM's diploma has just one related module on Water Resources, and nothing on hydrology.

Here's the point: nobody but hydrologists cares about the professional status of hydrologists. We are more likely to see hell freeze over than see any of the institutions provide a professional home for hydrologists that recognises their skills.

Unless we can find a way to implement a Chartered Hydrologist status through some mechanism, hydrologists will always have to become "chartered" through some body that does not really have their interests at heart in the way BHS does.

And that's not going to change, is it? I wonder if any of the "Institutions" are up to the challenge of providing a real home. So for now, and the foreseeable future, I am chartered with two different bodies for practical reasons, but BHS is where my hydrological heart lies.

Best wishes

John Mosedale
Environment Agency Wales
john@twmpath.plus.com

President's reply

John,

Many thanks for your contribution. It touched a nerve at a critical time in our drive to improve professional development for hydrologists. I suspect other members will sympathise with your views, and the questionnaire should help us move forward. I hope you will be able to join in the debate at the ACM in Durham.

I must take issue with you on the current attitude of ICE to hydrologists. There has been a gradual change there and our recent dealings with ICE senior managers show much greater efforts and a range of less onerous routes.

You can be assured that BHS will work hard to satisfy the aspirations of the majority of our members.

Best wishes,

Rod

Invigorating UNESCOs' International Hydrological Programme

Some reflections on the 17th Session of the Intergovernmental Council, Paris, 3–7 July 2006, by John C. Rodda

For the first time since 1978-79, the UK has taken a seat on the Intergovernmental Council of the International Hydrological Programme of UNESCO.

Even more significantly, for the first time in the 30-year history of the IHP, the UK (**Professor Alan Jenkins**, Water Programme Director at the Centre for Ecology and Hydrology) has been elected as one of the four Vice Chairs of the Council.

The Council, which consists of 36 members elected by the General Conference of UNESCO, meets every two years to oversee the progress of the Programme. This year, as usual, it met in Paris, with observers from UNESCO members not on the Council, representatives of UN bodies and agencies such as WMO and from international non-governmental associations. The UK delegation was led by Alan Jenkins, supported by **Alan Gustard**, **Gwyn Rees** and **John Rodda**.

Overshadowed by the Eiffel Tower and lying close to Les Invalides, the architecturally-striking building housing UNESCO is being renovated. Swarms of workmen are infesting this 1950s structure to bring it into the 21st Century. Renovation, it could be argued, is something that is also taking place within the Programme. An alternative view would be that renovation needs to be taking place, so that progress is invigorated by a new approach.

Started in 1965 as the successor to the International Hydrological Decade, the IHP is now in its sixth phase and a seventh is being planned. Over the years its content and how it advances has been largely determined by contributions from the hydrological communities of the members of UNESCO, channelled through the IHP national committees. Consequently the different phases have ranged far and wide across the spectrum of hydrological problems to satisfy the interests of the 180 or so Members.

One of the best known and most successful contributions is the FRIEND Programme which was initiated by the



The UK's invigoration squad for IHP: Alan Jenkins (right) supported by John Rodda (left) and Gwyn Rees (centre back)

UK and a consortium of western European nations and now has a global dimension with over 100 Countries participating. In recent years several fresh initiatives have been set in motion with active UK participation. These are HELP, the UNESCO Centre on Water Law and Policy at Dundee and G-Wadi. The PUB Programme of IAHS is another in the same vein.

But things are changing in the IHP. More and more UNESCO water-related centres are being established to tackle particular international or regional problems. There are now twelve, and four new centres are proposed. This poses the challenge of how to ensure that the work of these centres fits the aims and objectives of the Programme.

A strategy is to be developed to harness their contributions to the IHP by a special task force. The draft plan for the 7th phase of the Programme, which will run from 2008 to 2013, touches on this point, but it is more concerned with the activities falling under the four themes proposed for IHP VII and with the development of a new fifth theme on education.

The Council debated these matters and the governance of the Programme. This vexing issue has split the Council between those delegations supporting the concept of six regional intergovernmental councils (RICs), one for each UNESCO Region, and those against. Since this proposal was first tabled in 1992, the UK has been one of those seeing little value in establishing RICs. Duplication of effort, extra costs and an increase in bureaucracy are foreseen, but little or no invigoration of the scientific effort.

It is vital that the IHP continues to stimulate progress in hydrology and water resources, especially as it is increasingly competing for the interest and effort of hydrologists against other international initiatives: these may have funds, more attractive and relevant projects and better outlets for their results. In terms of improving governance, it would be more profitable to the Programme to find ways to stimulate the work of national IHP committees so that they contribute more effectively to the Programme. Many of these committees are weak, especially those in Africa, so assistance directed to the functioning of national committees would be significant nationally and internationally.

Of course, an established international programme such as the IHP has a lot going for it. There are two international decades currently under way that demand efforts from the IHP: The International Decade for Action—Water for Life (2005-2015) and the UN Decade of Education for Sustainable Development and there are also those activities directed to the achievement of the Millennium Development Goals. In addition there are several exciting new initiatives under way, such as the International Flood Initiative and the International Sediment Initiative, where the UK has a central role to play. Indeed opportunities for UK hydrologists to engage in the IHP, to collaborate with fellow scientists from every corner of the world, have never been better.

For further information please contact the secretary, Gwyn Rees, at CEH *(hgrees@ceh.ac.uk)*.

EGU General Assembly 2006

European Geosciences Union General Assembly
Vienna, Austria
2–7 April 2006

The EGU met in Vienna this year and the British Hydrological Society helped fund the attendance of five researchers, all interested in very different topics, all but one from Newcastle University. Here we report upon our impressions of the meeting through a summary of our topics of interest: (a) *Hydromorphology, environmental flow and river restoration:* Claire Walsh; (b) *Recent developments in river sediment dynamics:* Aylen Carrasco; (c) *Peat degradation and carbon cycling*: Angela Wakefield (Lancaster University); (d) *Climatic extremes and their impacts:* Stephen Blenkinsop, and (e) *Downscaling information from climate change models for use in impact studies*: Hayley Fowler. We would all like to thank BHS for financial help that enabled us to attend this meeting.

(a) Hydromorphology, environmental flow and river restoration — *Claire Walsh, Newcastle University*

Session HS19: *Environmental flow and river restoration* included six oral papers and twelve poster contributions.

The oral session, chaired by **Doerthe Tetzlaff** (University of Aberdeen) and **Sue White** (Cranfield University) began with my contribution: *'Typology approach to assessing the impact of climate change on instream physical habitats'*. The Environment Agency Climate Change Unit is funding this project to derive a process-based typology that has ecological relevance and can incorporate climate change. Based on the Eden catchment, Cumbria, the initial step is to derive a typology of river channels using standard GIS datasets such as geology, channel slope, floodplain extent and stream power. Field-based data are being collected, including the occurrence of biotopes, to verify the initial typology and describe the types found.

Hydraulic modelling of derived types and sequences of biotopes will allow assessment of hydraulic conditions such as flow depth, velocity and Froude number. The final component of the methodology will include assessment of hydraulic conditions of critical habitats based on changes in flow under future climate change. This project seeks to inform implementation of the Water Framework Directive, by considering climate change impacts on characterisation, assessment and programmes of measures in a strategic, science-based, catchment-scale test.

The second presentation by **Monica Rivas** (Cranfield University) focused on sampling strategies for hydromorphological parameters in river restoration projects. Given that it is not possible to survey entire systems, interpolation techniques are required to decrease the amount of data collected.

Monica defined three main concepts to be considered when defining sampling strategies: (1) the spatial pattern, which determines the degree of variability between data collected and hence provides information on the sampling density required; (2) the spatial scale, providing information on the length of reach to be surveyed; (3) the temporal scale, which determines how often the selected reach needs to be sampled for a specific purpose.

Ultimately this work will lead to a set of guidelines for data collection of hydromorphological parameters for the application of interpolation techniques when assessing river restoration projects.

Bernhard Zeiringer (University of Vienna) then presented a paper on

'Environmental flow assessment: case studies at three hydropower plants in Austria'. The three case studies are in different geological regions but are all important salmonid streams. The results show that it is not only the minimum flow that determines the ecological status in streams affected by residual flow from the hydropower plants. So do other factors, such as the type of original fish assemblage, morphological conditions, length of water abstraction and spill water flow.

Iain Malcolm (Freshwater Laboratory, Pitlochry) presented the findings of recent inter-disciplinary investigations of groundwater-surface water interactions in the hyporheic zone of an upland spawning stream in the Cairngorms, northeast Scotland. Hydro-chemical tracers, water quality and hydraulic head data were used to characterise hyporheic water quality and infer the nature of groundwater-surface water interactions at nested spatial and temporal scales.

Groundwater inputs were found to be controlled by scale, geology and geomorphology at the catchment scale, while at the reach scale factors included local geomorphology and stratigraphy of the stream bed materials. Where there was strong groundwater upwelling, dissolved oxygen level, and hence embryo survival, was poor. Sites of transient groundwater intrusion gave oxygen levels suitable for hatching, but still affected embryo performance, with the potential to affect post-emergent fitness. Iain emphasised the importance of inter-disciplinary working to understand the links between hydrology, hydrochemistry and freshwater ecology.

In the final presentation, *'Integrating scales in environmental flow assessments - what is the role of hydrology?'*, **Chris Soulsby** (Aberdeen University) argued that the hydrological community has been slow to respond to the Water Framework Directive's demands of understanding how hydrological regimes contribute to the physical structure of rivers, which also influence the structure and function of aquatic communities.

He backed up his argument with the number and size of sessions on environmental flow assessment at the EGU this year. He pointed out that despite over 400 different environmental flow methods in 60 different countries (certainly an improvement on traditional hydrometrically defined methods), these are perhaps still crudely based on the real needs of riverine ecological communities. Good ecological data are essential: hence collaboration with ecologists and managers must be the starting point.

I would also like to highlight a day-long session held on the Tuesday: *The McCulloch Symposium: a view from the watershed 2006*. As many of you will know, **Jim McCulloch** was central to the creation and early development of the former Institute of Hydrology (now part of CEH) in the 1960s. During the session, presentations were given by some of the original team of IH researchers, including **Enda O'Connell** and **Keith Beven**. A number of internationally renowned hydrologists who were linked with or worked at IH also presented at the symposium, for example **Jim Wallace** and **Ezio Todini**.

It is quite remarkable the number of 'original' hydrologists from the Institute of Hydrology who are now leaders in their respective fields and manage successful research groups. The presentations provoked stimulating discussions, and it is observing such interactions between speakers, allowing you to see your work in a wider context, as well as the networking opportunities, that makes EGU a unique conference to attend.

(b) Recent developments in river sediment dynamics — *Aylen Carrasco, Newcastle University*

Because of the number of contributions received under this subject, it was divided into two parts: oral and poster presentations. The session provided an overview of research in river dynamics, from the very small scale, such as the micro-structures of coarse grains, through channel bed morphology, to river dynamics at the meso-scale, such as the amount of sediment deposited during the Holocene period.

The oral presentations began with **C. Choux** (University of Leeds) who presented *"Studying turbulence modulation – in gravel-bed rivers - with invisible particles"*. The group conducted experiments in a turbulence-mixing box with high concentration fluid using invisible particles (particles become invisible in the liquid) and a Particle Image Velocimetry (PIV) system. The main aim is to increase understanding of the interactions between particles and flow dynamics.

T. Vetter (Halle, Germany) gave a talk on channel dynamics of a riffle-pool floodplain river under disturbed and undisturbed sediment load conditions, based on work on the Mulde River, Germany, where the analysis of the river channel dynamics related to flood adaptation. **Thomas Hoffmann** (University of Bonn, Germany) talked about Holocene flood plain sediment storage and hill slope erosion within the Rhine catchment.

A. Fourriere (ESPCI, Paris) gave a presentation on river width selection. Small-scale experiments (1 x 0.5 m channel) had been conducted under controlled conditions to test a width-to-flow rate law. The same law was then compared with measurements in natural sand rivers.

I closed the session with a paper on experimental studies in bar formation. The objective of my work was to conduct an experimental study guided by linear stability theories to determine the bar formation process along an initially straight channel. This was carried out using a regime flume facility with movable bed and banks.

Alternate bars were studied to improve understanding of river morphology, mainly motivated by the belief that bars are the fundamental morpho-dynamic building block required to form meanders and braided beds, which means they have important consequences for river ecology and river training.

Experimental studies (e.g. Fujita and Muramoto,1985; Lanzoni, 2000) have shown that bars form when a small perturbation of the bottom is capable of triggering a first bar. The deformed flow field downstream of the initial bar then generates further bars "just like in a chain reaction". As a consequence, bar height usually decreases in the flow direction while bar celerity increases. This behaviour is responsible for the observed increase in bar wavelength.

In fact, downstream bars move faster than upstream ones and the distance between consecutives fronts increases. I compared the results between experiments with fixed and movable banks. For movable banks, the wavelength of the bars increases with every time step. This is likely to be due to the channel seeking an equilibrium configuration and bank erosion contributing enough sediment to bar development.

On the other hand, for fixed banks the wavelength distribution is the same in every time step. The channel here is trying to find equilibrium but it lacks extra material, i.e. the bank material. At every time step bars appear at the channel entrance, growing while migrating downstream, but never reaching equilibrium.

Personally I found the conference very useful, enabling me to contact different potential collaborators. For example, **Walter Bertoldi** (Trento University) presented a poster on *"Bank erosion and channel shift in braided networks"*, and **Heather Monteith** (Glasgow University) is doing compositional analysis of stress history effects on the stability of graded river bed.

(c) Peat degradation and carbon cycling — *Angela Wakefield, Lancaster University*

This General Assembly saw a wide spectrum of European peatland research across several Programme Groups, highlighting the growing importance of examining the negative effects of climate change and land management practices in peatlands. This year peatland research received particular attention in the Hydrological Sciences programme with the *"Peatlands: processes and policy session"* convened by **Sake van der Schaaf**

(Wageningen University, The Netherlands). Research topics had particular emphasis on the impact of peat degradation on carbon release, hydrology and water quality.

Research into peatland hydrology has been mainly process-based, studying the influence of peatland drainage or climate-induced drought on the biogeochemistry of carbon cycling in terms of CO_2 fluxes to the atmosphere (**James Rowson**, Durham University) and carbon loss via fluvial pathways in the form of dissolved organic carbon (**Z. E. Wallage**, Leeds University).

The analysis of Environmental Change Network monitoring data by **Fred Worrall** (Durham University), to investigate the controls on the release of DOC from peatlands under drought conditions, revealed important findings about the behaviour of hydrological flow paths within peat. However, it is clear from work presented by **S. Van der Schaaf** (Wageningen University) on the discharge behaviour of raised bogs that there are still large gaps in understanding the movement and storage of water within peatland systems.

The importance of particulate release as a component of the carbon budget was also emphasised in work presented by myself and **Richard Pawson** (Manchester University). We both highlighted the need to consider biologically controlled losses of particulate organic carbon (POC) from peat catchments as significant, rather than only physical controls. Examples include the potential for the oxidation of surface peat and the extent to which peat becomes oxidised in the fluvial system.

New technical developments in peatland erosion research included high resolution digital terrain elevation data enabling small-scale process-based measurements to be linked to larger-scale landscape processes (**Martin Evans**, Manchester University).

This conference was a unique opportunity for peatland scientists to come together and expose our research to the wider scientific audience, highlighting the importance of peatlands in the context of climate change.

The opportunity for me as a PhD student to present my work at my first international congress and to receive comments from top scientists in my field was invaluable. I made some very important contacts from the UK and Europe which I hope will lead to collaboration and maybe field visits abroad. I would encourage other students to take full advantage of the fantastic opportunity offered by BHS financial support!

(d) Climatic extremes and their impacts — *Stephen Blenkinsop, Newcastle University*

This session promised to be interesting, relevant to me and at the forefront of current research in climatology. My PhD thesis examined relationships between observed climate extremes and large-scale atmospheric circulation, and my work now is looking at how well climate models reproduce extreme events for the provision of climate scenarios for hydrological modelling.

The oral programme lasted almost a full day. Presentations included studies of model verification as well as probabilistic future scenarios of extremes, spatial downscaling of climate model output and the attribution of changes in extremes.

Ole Christensen (Danish Meteorological Institute) gave the session's solicited talk. He discussed the use of the HIRHAM regional climate model (RCM) to reproduce precipitation extremes. Simulations at finer resolutions (12 km compared with 50 km) fit the observed pattern of precipitation extremes over Europe better. The higher resolution model was more able to capture the processes responsible for extremes, enabling a better analysis of how local variations in extremes relate to single events and to spatial correlation of precipitation.

Katerina Goubanova (Laboratoire de Météorologie Dynamique, Paris) and **Christina Anagnostopoulou** (University of Thessaloniki) also assessed the ability of models to reproduce observed characteristics of extreme events. Katerina used the LMDZ variable-resolution general circulation model (GCM) and the Generalized Extreme Value (GEV) distribution to estimate the 30-year return value of hot and cold extremes and also of 1-day precipitation totals.

The model gave results for warm extremes that were similar to the observations over the whole European region, but for cold extremes it performed well only over central and southern Europe — the reason was not known. However, the model underestimated the 30-year return value of seasonal maximum precipitation, largely because of an underestimation of the interannual variability of heavy rainfalls. Christina had carried out a regional study of the eastern Mediterranean and assessed the HadAM3P GCM, comparing extremes calculated using two different parametric methods, the GEV and Pareto distributions.

Rasmus Benestad (Norwegian Meteorological Institute) provided a change of direction from model verification and addressed the statistical downscaling of large-scale model output to local scales. Traditional methods use linear models, but these are problematic for analysing extremes: they are of limited use for the tails of a distribution and for future scenarios are unable to produce values outside the historical sampling range. He showed that daily precipitation amounts can be approximated by an exponential distribution. The exponential coefficient has a systematic relationship with local mean temperature and precipitation, allowing an estimation of extreme values from mean conditions. He showed that it is possible to downscale distributions of extremes using the exponential distribution and indicated an increase in extreme precipitation events and more wet days over northern Europe.

Petra Friederichs (University of Bonn) described an alternative statistical downscaling approach using quantile regression and argued that the approach better accounts for the binary character of precipitation events, and by using large-scale circulation data identified specific dynamics that produce extreme events.

Wilhelm May (Danish Meteorological Institute) returned to model verification and presented some work associated with Ole Christensen's assessing the HIRHAM model with respect to extreme precipitation, calculating 30-year return values to demonstrate an underestimation of the intensity of daily and extreme European precipitation events in all seasons except winter, but that the intensity of extreme daily precipitation is generally enhanced when the simulation is run at a finer resolution.

Hayley Fowler (University of Newcastle) presented a study of extreme precipitation for the UK. Rather than using just results from one climate model, she compared the relative performance of six RCMs in reproducing observed extreme statistics.

By examining 10-year return period events with durations of between 1 and 20 days, it was shown that the RCMs showed great variability in estimates when compared to an observed series: all models underestimated the magnitude of the 1-day event, but HADRM3P performed best in reproducing the spatial variation of extreme precipitation. Aggregating the results into nine regions using a technique called regional frequency analysis produced a spatial distribution that more closely reflected the observed climate, with the models performing better for 10-day than for 1-day totals.

Finally, future changes in extremes were examined using the future scenarios for the same RCMs and it was noted that the difference in results could be attributed not only to the choice of RCM but also to the GCM that was used to provide the driving conditions for the regional models. Such a multi-model approach should be used in the future, it was argued, to construct probabilistic scenarios of climate change.

Shiyu Wang (Met Eireann) presented some interesting work that linked in with this idea of probabilistic climate change scenarios by using multi-model assessments of climate. He used the

Rossby Centre Regional Atmosphere model but driven by ERA40 Reanalysis data and ECHAM4 and ECHAM5 GCM boundary data. Observations for the Republic of Ireland were compared with model output for mean annual precipitation and the 20-year return value of 1- to 5-day extreme totals. The choice of driving data is important and produces different results for both the control and future scenarios.

Nikos Christidis (UK Met Office) then presented some extremely interesting work on the attribution of changes in extreme temperature events, the only presentation on this in the session. Along with his colleagues at the Met Office he has applied the optimal fingerprinting technique, which uses a generalised multivariate regression, and has generally only been applied to mean temperatures.

By comparing a range of the most extreme days, from the 30th most extreme day to the most extreme day each year, they found large changes relative to the mean, demonstrating that changes in extremes cannot be inferred from the mean. Using the HadCM3 climate model they indicated that natural factors alone could not account for the observed changes but adding anthropogenic factors could.

The same fingerprinting technique was also applied to examine the length of the growing season. This was shown to have lengthened on global and continental scales, largely because of the earlier onset of spring. Both of these changes could be attributed to anthropogenic factors alone.

Another talk that broadened the range of the session was by **Maciej Radziejewski** (Polish Academy of Sciences) whose research bridged the gap between climatology and hydrology with a study of European and US river flows. Previous research had shown no evidence of statistically significant changes on a global scale, but this may be due to the choice of measurements used, with the use of extreme flows with return periods of 20-60 years more sensitive than the use of annual maximum flows or point-over-threshold measures.

Presentations by **Mónika Lakatos** (Hungarian Meteorological Service) on the occurrence of heat waves in Hungary, **Petr Dobrovolný** (Masaryk University) on trends in strong winds in the Czech Republic, and **Kate Chromá** (also from Masaryk University) on temporal and spatial variability in hailstorms in the Czech Republic completed an informative session with wide variety of talks.

(e) Downscaling information from climate change models for use in impact studies — *Hayley Fowler, Newcastle University*

The H13 session *"Linking climate change modelling to impacts studies: downscaling techniques for hydrological impact studies"* attracted a lot of interest, with 33 abstracts submitted. It was run jointly with *Atmospheric Sciences and Climate: Past, Present and Future*.

I convened this session with **Eric Salathé** (University of Washington, US) and **Marco Marani** (University of Padova, Italy). Despite being given the "graveyard" Friday afternoon slot, the oral session was very well attended and more than 60 were still there by 5 p.m. I was also able to present some of my work on extremes and a poster on temperature trends in the Karakoram.

I had two reasons for wanting to run a session on this topic: (i) to explore new developments in "downscaling", linking coarse-scale climate modelling and local-scale hydrological impacts studies ("Where are we now?") and (ii) to think about interactions needed between the hydrological impacts and climate modelling communities for further progress ("Where should we be going?"). Using different downscaling techniques may produce very different impacts, as may the use of different climate models. We need to move on from simple comparisons to develop probabilistic frameworks for climate change to be used in impact studies.

Rob Wilby (Environment Agency) did a great job in setting the scene in his invited paper. He asked us, "What have we leant so far?" It appears that we have learnt rather a lot. We know, for example, that statistical and dynamical downscaling methods show comparable skill, that some methods are better than others for downscaling certain variables and that some climate models simulate current climate (1961-90) much better than others.

How can we use this information though? Rob outlined a method to embed downscaling within a probabilistic framework, recently published in *Water Resources Research*, using low flows on the River Thames as an example. Climate models were weighted according to their ability to simulate effective winter rainfall — the critical variable for summer flows in the Thames — for the control period (1961-90). A Monte Carlo analysis was then used to produce probability distributions of impacts.

However, probabilistic methods may throw up as many questions as answers. Rob outlined some of these: for example, how do we decide which probability or risk of failure to design to? These questions need to be answered before we can begin to use the probabilistic climate change scenarios for the UK that will be provided by UKCIPnext.

Axel Bronstert (Potsdam University, Germany) compared three downscaling methods for a case study in Germany. **Ruwani Walawege** (University of Cape Town, South Africa) then presented a comparison of the impacts of using different GCMs as input to different dynamical and statistical downscaling techniques, and their effects on future river flows in South Africa. Unsurprisingly, different GCMs gave very different results, but there is still a need to interpret these results — how do we use the results from different climate models, different downscaling methods, etc.?

Julien Boe (CERFACS, France) presented some interesting results on the effects of changing the climate model resolution. Even when using very high resolution dynamical downscaling, further statistical downscaling is needed to provide realistic climatic time series for impact studies.

Erik Kjellström (SMHI, Sweden) concluded the first session, presenting some results from the new transient run of the Rossby Centre's RCAO regional climate model, 1960-2100. He asked whether pattern scaling could reproduce the regional climate change signal in other periods, and was it applicable to all climatic variables.

Pattern scaling generally assumes that change in all climatic variables is linearly related to global temperature change. However, this transient run has shown that this is not the case, particularly for precipitation. Precipitation increases dramatically in northern Europe over the early 21st century — it is warmer and moister at a very early stage because of a rapid change in the meridional pressure gradient — followed by a slowing of change towards the end of this century. In lay terms, if we use pattern scaling from equilibrium RCM runs we will underestimate the change in precipitation in the first half of the 21st century. Worryingly, this is exactly what the UKCIP02 scenarios are using!

Eric Salathé opened the second session by presenting some of the issues involved in scenario selection, downscaling methods, and interrelating the various approaches, developing Rob's opening theme. **Steve Charles** (CSIRO, Australia) presented a study examining the effects of bias in GCM simulations on projected hydrological impacts in Australia, and methods of overcoming these biases.

Stephen Blenkinsop (Newcastle University, UK) then presented some of the work being done at Newcastle in the FP6 AquaTerra Integrated Project. The idea behind it is to produce probabilistic climate change scenarios for different river basins in Europe to examine hydrological impacts. We have evaluated different regional climate model runs from the PRUDENCE project to assess their ability to reproduce mean climate statistics for the 1961-90 control period.

Results were presented for seasonal mean precipitation across Europe and for the annual cycle of precipitation for selected catchments, as well as for two indices of drought for the UK. These

showed that there is no one best model: model performance varies both spatially and seasonally. The choice of boundary conditions used to drive the models also has a significant bearing on model performance. This will lead on to development of a weighted multi-model approach to the production of probabilistic climate change scenarios.

Robert Leander (KNMI, The Netherlands) described a new non-linear method to correct bias in climate model outputs. Linear bias correction techniques (simply correcting the monthly means) have been shown to reduce the variability and extremes of simulated precipitation. This new technique can reproduce the variability and extremes of multi-day rainfalls, something that should be considered when simulating extreme river flows.

Malcolm Haylock (University of East Anglia) presented the results of STARDEX, a huge collaborative project which compared 22 different statistical and dynamical downscaling methods, particularly examining extremes. The researchers concluded that the differences between different methods can be larger than the differences between emissions scenarios, although they used only one model, HadRM3.

Hans Caspary (Stuttgart University, Germany) came full circle, showing how a climate change factor has now been introduced into the design flood calculation standard in Southern Germany, based on results from the ECHAM4 climate model run for the B2 emissions scenario. He concluded by saying that "adaptation of existing flood protection measures is much more expensive than adaptation by including a climate change factor in planning". Further information can be found at: *www.kliwa.de/de/ergebnisse/index.html*.

This brought to an end an extremely well attended and interesting session. I would like to think that we made a start on thinking about some of the questions that Rob and I posed at the very beginning, but there is still a long way to go. It will take a concerted effort from the hydrological and climatological communities to provide robust solutions to the problem of climate change.

I would like to thank all the speakers and those who took part in the poster session for stimulating presentations and discussions. I hope that this is just the beginning…

Decision making involving spatially distributed systems

2nd International Forum on Engineering Decision Making Lake Louise, Canada 26–30 April 2006

This meeting primarily concerned risk and reliability of engineering problems with spatial aspects, and the attendant decision making. It was a small workshop of 32 participants, all of whom presented their work.

The presentations covered a wide range of scales of spatially distributed system, ranging from a few cm to many km. There was also a wide range of application areas covered, ranging from small-scale property variations of glass, through the influence of soil variability on foundation stability, to motorway repair scheduling, avalanche runout, flood defences and earthquake damage. Although a number of authors referred to the potential decision making application of their work, disappointingly few were able to describe practical decision-making tools. It was suggested at the end of the forum that this reflected the dominance of academics attending.

I presented a study of the system reliability of the London to Bristol railway line, which is subject to rainfall-induced landslides. These landslides are a significant problem on this line, and there is a question whether their incidence will increase with future climates, necessitating a re-evaluation of maintenance priorities.

Using a rainfall correlation model based on historical rainfall records, and rainfall distributions from the new Environment Agency stochastic weather generator, EARWIG, for each site and climate scenario of interest, simulation of system performance was done by running six-month simulations using the CHASM slope hydrology and stability model for slopes at chosen locations.

It was shown that failure is most likely to occur at the western part of the line, and that the probability and timing of likely failure depends critically on the end-of-summer moisture profile, with more and earlier failures occurring after a wetter summer. In addition, for the current dominant failure mechanism, system failures can be expected to decrease with future climates, with the difference between probability of failure between the western and eastern ends of the line becoming increasingly exaggerated.

Presentations on the reliability of flood defence systems were given by **Jim Hall** (Newcastle University) and **Ton Vrouwenvelder** (Delft University). Jim Hall demonstrated that the use of risk based sampling greatly increases the convergence rate of schemes for broad-scale flood risk assessment of coastal and fluvial flood risk in the UK, and illustrated this with examples related to flooding in Burton-on-Trent and Towyn.

Ton Vrouwenvelder described the many correlations, both in space and time, involved in the risk calculation of a ring-dyke system, showing the effects of different time-scales (tide and river level variation, seasonality), and spatial scales (horizontal and vertical variation of dyke soil properties), in a reliability calculation of Hoeksche Waard.

One issue that was made very clear by juxtaposition of various talks, and in discussion, was the abundance of parallels between damage assessment of rainfall-induced damage, such as flooding and landslides, and earthquake-induced damage. This occurs in a variety of contexts: in the prediction of extreme events, in the assessment of the decay of severity of strength with distance, and in the assessment of multiple impacts both from the point of view of insurance risk, and damage to distributed systems, such as transport networks.

I am grateful to BHS for enabling me to attend this very interesting meeting, which demonstrated the value of sharing ideas with researchers from different backgrounds.

Lucy Manning
Newcastle University

Catchment management

BHS Pennines Hydrological Society Meeting
University of Newcastle upon Tyne
24 May 2006

More than 50 people attended the PHG meeting at Newcastle and the group's annual field visit, which was to Nafferton Farm, Newcastle University's sustainable farm initiative.

The morning began with a series of short presentations. The first was by **Martin McGrath** (United Utilities), who is currently leading the Sustainable Catchment Management Programme (SCaMP). This was developed in association with the RSPB to develop an integrated approach to catchment management within two key areas of United Utilities land, Bowland and the Peak District. SCaMP will help to deliver government targets for SSSIs, enhance biodiversity, ensure a sustainable future for the company's agricultural tenants and protect and improve water quality.
The scheme will use a combination of management interventions such as re-wetting moorland areas, reducing grazing pressure and re-establishing vegetation and woodland planting for ground stabilisation. Extensive monitoring will be used to show the effects of the land management interventions on hydrology, water quality and vegetation. Following Martin's presentation discussion focused on whether the proposed woodland plantations would affect overall water supply in the area.

The second talk was by **Andrew Moore** (Arup) on flood risk assessment for rural and urban land-use planning in north-east Yorkshire. Arup have recently completed a Strategic Flood Risk Assessment (SFRA) for Ryedale District Council, Scarborough Borough Council and the North York Moors National Park Authority. The area covers 2700 km^2 and provides a diverse mix of land use types. It contains sites with prolonged histories of flooding from rivers, the sea, groundwater and overland flow.

The SFRA approach was to assess different levels of flood risk in north-east Yorkshire and to map them to assist with land-use planning. Using a range of approaches Arup were able to add to existing guidance on flood risk and make further policy recommendations. In terms of development guidance, indication of appropriate types, design and developments suitable behind flood defences could be given. For land use management, they made suggestions for SuDs, agricultural land management practices and installation of wetlands. Andrew described an unexpected, but timely, flooding incident in June 2005: there was no previous account of fluvial flooding in the area, so this increased awareness of the risk from overland flow.

Stephen Merrett (water resources management consultant) gave a paper entitled: 'Demand management and new house building: a study from the Thames Region'. He said that control of new house building is often neglected as a demand management tool for water resources planning. His paper examined the likely water resource impacts of new house building in the Thames region between 2006 and 2025.

Based on the regional assembly's strategic plan, around 950000 dwellings are planned for the region. Assuming the 2001 ratio of 2.33 persons per dwelling and the current average water usage of 160 litres per day, the region would use an additional 352 million litres per day.

However, Stephen also discussed the potential additions or subtractions from these demands. For example, climate change (in the form of wetter winters but longer dryer and hotter summers) will cause a net decline in rainfall, coupled with greater demand for showers, garden sprinklers etc. On the other hand, demand may decrease as more households become metered, as leakage reduction, inter-basin transfers and desalinisation plants come into place and if there is the anticipated reduction in household size.

The obvious way to combat this problem is to reduce house building targets, giving a tighter housing market and a decrease in net migration into the region. Stephen suggested that if new house building was focused on rental, the housing associations' access to land would be improved.

Paul Scholefield (Lancaster University) presented a paper on the application of fuzzy decision trees in predicting phosphorus retention and delivery in headwater catchments in the UK. Paul's approach combines national coverage of base flow index data, mean annual rainfall with field measurements of soil phosphorus and catchment connectivity to the drainage network. By incorporating a standardised phosphorus test, other qualitative variables can be incorporated, e.g. acceleration of delivery due to topographic features.

The method has been applied to data-rich agricultural catchments and the next steps include validating the model with winter data. Model optimisation is flexible, allowing new data to be added when available. It is applicable to all catchments in England and Wales and Paul hoped that the approach will better inform policy and mitigation decisions based on limited information.

David Archer (JBA) spoke about investigating the influence of river regulation at Kielder Water on the thermal regime of the River North Tyne. Prior to releases from Kielder reservoir, the most notable features of the annual temperature cycle were a developing thermocline in early May and the turnover of reservoir water in autumn.

Since it became operational, monitoring has shown Kielder to lower the natural temperature in the North Tyne from April to August by 1 – 3°C, whereas increases of up to 4°C have been recorded between September and March. River temperature may affect all stages of the salmonid life cycle, but David's work focused on the emergence of fry from the gravel to commence feeding and smolting.

On average no delay was found between swim-up and feeding at the regulation-affected sites, whereas a decrease in summer release temperatures could delay smolting. Smolting would therefore occur late in the summer when downstream discharge pollution levels and temperatures are higher, and this would increase mortality during migration back to the sea. Reservoirs do not only affect water temperature but have other impacts, such as discharge pulses, and these may affect salmonids and other species, including invertebrates.

Malcolm Newson gave a paper on 'The spectre of 'siltation' in SAC rivers: some observations from the Wensum, Nar (Norfolk) and the Yorkshire Derwent'. Siltation is an issue for habitats of key species, particularly following river pollution and river engineering. Its regulation is further complicated because it may have diffuse catchment sources.

Fluvial audits are increasingly being used to provide the geomorphological context for the conservation strategy of rivers. Historical, contemporary, process dynamics issues and spatial patterns of sediment can be inferred from geomorphology. Malcolm described a number of case studies which have used fluvial audit assessment to address key management

questions. For example in the Yorkshire Derwent catchment, it was used to identify and confirm a siltation problem and to aid suggestions for further monitoring and remediation, such as land management of the most vulnerable locations. However, it is not always that simple, as sediment is different between catchments and reaches, different sediment types pose different problems, and impacts will vary between biota and depend on the life stage of the biota. Further understanding of such issues is required to contribute to the targets set by the EU's Water Framework Directive and the Habitats Directive.

The final presentation was by **Rebecca Humphrey** (ADAS), who described the Whittle Dene Catchment Project, which is designed to investigate the interactions between agriculture and water quality in a typical semi-upland area of north-east England. The Whittle Dene has had problems with excess pesticides, nutrients and pathogens, which ultimately drain into Northumbrian Water's reservoir system.

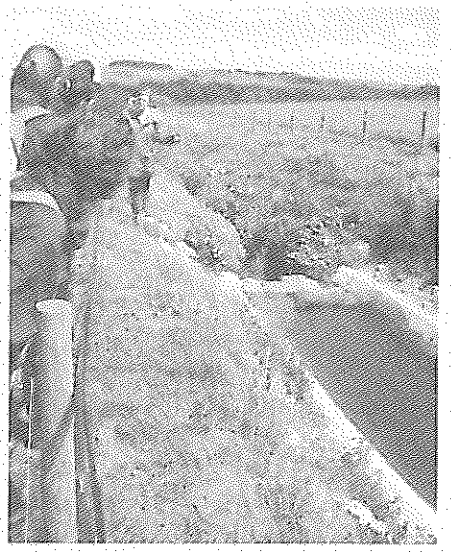
Following a period of baseline monitoring of water quantity and quality parameters (phosphorus, nitrate, pesticides, sediment and microbiology), a number of land management options were identified. Some are now being implemented, such as fencing to prevent livestock entering the burn, buffer strips and installation of a biobed.

The project aims to examine sources and transport of pollutants and the interactions between them, and examine the effectiveness of methods designed to improve water quality in managing several inputs to water. It provides a valuable insight into farmer response to emerging agri-environmental policies and initiatives. It also demonstrates the complexity associated with addressing diffuse nutrient losses in a catchment and in complying with the Water Framework Directive. Since the Whittle Dene catchment adjoins Nafferton Farm, where some of the same techniques have been employed, Rebecca's presentation was a useful introduction to the afternoon's field visit.

Field visit to Nafferton Farm

The afternoon visit was to Newcastle University's Sustainable Farm Laboratory, which investigates and promotes integrated runoff management plans at source (i.e. on the farm). The aim is to establish Integrated Runoff Management Plans for UK farms as part of the push for farm management plans and to address the impact of future rural land changes on the Water Framework Directive. The tour was conducted by **Paul Quinn**, **Jennine Jonczyk** and **Sebastien Tellier**.

As well as trying to capture most of the runoff coming from the farm hardstandings and the overland flow from back and tank fields, the Sustainable Farm initiative looks at slowing down storm water within the farm's ditch network, presently in Gilchrist strip ditch. We were able to see a number of new and better known remediation techniques.



Sediment trap and ochre pod (Photo: M. D. Newson)

Infiltration ponds have been built using bunds, positioned to intercept overland flow from fields and store it to allow infiltration. Overland flow from the nearby main road is intercepted by drains and delivered to the infiltration pond. The capacities of the ponds are designed to work in most storms. Econoplas is used to intercept the remainder of the overland flow and deliver it to the pond. The original position of the pond was challenged by the farmer and it had to be moved to keep the cows happy!

In the sediment trap and ochre pod water is slowed by an ochre barrier in order for sediment and associated phosphorus to be deposited in the concrete structure, therefore reducing total phosphorus load. The nutrient-rich sediment is to be recycled back on the land when the concrete structure is close to capacity. The ochre pellets (iron hydroxide) remove soluble phosphorus from the water. Ideally the ochre will be used as fertiliser on the land.

In the algal pod, water is pumped from the ditch into a raised shallow slow moving tank beside the ditch. Algae will utilise nutrients in the water and therefore grow. The pod will be sporadically harvested and dried. Nutrients are removed by uptake into algae which is ultimately removed.

Using nutrients in the ditch helps to grow a wetland and a willow pod has been established: nutrients will be removed by biomass when harvested. Econoplas is used throughout various treatments to create temporary storm storage in the Gilchrist strip ditch.

The farm is instrumented at many locations to determine the efficiency of each of the measures; the final output to the Whittle Burn is monitored downstream of the farm. A state-of-the-art telemetered automatic "wet lab" system is used to sample at four different points daily and hourly during storm events.

Claire Walsh
Newcastle University

Sunsets, salmon, glaciers & Duck tape

How the 54th North American Benthological Society meeting in June was about much more than stream ecology

The North American Benthological Society (NABS) is in many respects the US equivalent of the Freshwater Biological Association. Members are primarily interested in stream ecology, although the society also attracts a large number of hydrologists and geochemists with applied interests.

For the 850 or so who attended the society's recent 54th annual meeting (4–8 June), the small city of Anchorage, in the largest US state of Alaska, was the destination. The shores of Cook Inlet and the surrounding Chugach Mountains provided a superb panoramic setting. Our 14th floor hotel room afforded excellent views of sunrise and sunset, but as the meeting wore on sunrise became something of an unknown, once we discovered the local nightlife along with co-researchers from London, Austria and Iceland!

The meeting began on the Sunday evening with an address from the current NABS president **Michael Barbour** (Tetra Tech), emphasising how NABS needs to communicate its science to the public better. The past-president, **Cliff Dahm** (University of New Mexico) then gave an interesting

account of his inter-disciplinary career in oceanography, geochemistry and stream ecology before presenting his perspectives on the need for future interdisciplinary freshwater science.

The 2006 NABS award of excellence was presented to **Jack Webster** (Virginia Tech University) who pioneered work on the concept of nutrient spiralling in stream ecosystems. Jack discussed ways in which stream ecosystems often display U-shaped responses of dependent to independent variables (e.g. total organic matter metabolism to distance from headwaters) and suggested novel approaches to modelling the processes driving these changes.

Approximately 500 oral and 250 poster presentations were given during the course of the meeting (see *www.benthos.org* for a full list of titles and abstracts). In amongst the NABS staple diet of researchers trying (still!) to disprove the River Continuum Concept, detail the influence of organic matter in streams and understand the effects of forest logging were some more interesting talks on contemporary stream ecosystem research.

John Richardson (University of British Columbia) detailed ways in which stream temperature measurements could potentially be used to drive models of stream biological responses to changing land use, via shifts in organic matter processing and consumer metabolism [Abstract 56].

Jack Stanford (University of Montana) spoke in detail about the role of spawning pink salmon influencing floodplain vegetation succession in the Kol River, Russia [276]. Over five million spawning salmon die in high-run years, leading to huge fluxes of nutrients to the riparian forest. Riverine productivity appeared to be highly dependent on interactions between these nutrients and riparian vegetation, soils and hyporheic flowpaths.

Along a similar fishy theme, **Jonathon Moore** (University of Washington) discussed how salmon function as ecosystem engineers through redd (nest) digging [317]. Although it is well known that salmon transport large amounts of salmon into river systems via their carcasses, Jonathon showed that most systems show minimal net nutrient gains because redd-digging leads to large-scale export of nitrogen and phosphorus.

Two special sessions were the highlight of NABS for me, given my research interests in rivers in cold environments. I presented my talk on the vulnerability of alpine stream biodiversity to shrinking glaciers and snowpacks [173] in the amusingly titled session 'Ice in your river, Sir?' The whole session was attended by over 100 people, despite the unearthly start time of 8 a.m. Presumably the delegates' appetites for learning more about glacier-fed river systems arose from having experienced them first-hand on the numerous glacier-themed tourist trips out of Anchorage. Other talks in the same session discussed the role of winter ice break-up on river hydrology (**Terry Prowse**, University of Victoria [169]), the evolution of stream communities following glacier retreat (**Sandy Milner**, University of Birmingham [170] and **Anne Robertson**, Roehampton University [171]), the hydrology and ecology of New Zealand glacier-fed streams (**Sarah Cadbury**, University of Birmingham [172]), temporary streams in alpine drainage basins (**Urs Uehlingher**, EAWAG [174]) and food webs in several contrasting streams on Svalbard (**Leo Füreder**, University of Innsbruck [175]).

I also attended a special session on *Arctic Stream Ecosystems in a Changing Environment* where **Bruce Peterson** (Marine Biological Laboratory) discussed how Arctic river discharges have already begun to alter, corresponding to regional changes in temperature and atmospheric circulation. Two linked talks in the same session by **J.P. Zarnetske** (Utah State University) and **M.E. Johnston-Greenwood** (University of Vermont) summarised recent research on contrasting arctic tundra streams (peat versus alluvial).

Zarnetske [136] explained how transient storage differed between the two systems, with the alluvial river having longer water residence time distributions. **Johnston-Greenwood** [137] went on to compare the depth of active hyporheic exchange and general biogeochemical dynamics, showing that the alluvial stream had a larger area of hyporheic exchange due to a greater permafrost depth. Water samples tested for nutrients and dissolved oxygen showed slower water flow through the peat stream hyporheic zone.

So where does Duck tape enter the equation? Well, apparently Alaskans use more of it per person than people in any other US state. We learned this valuable nugget of information on the final evening, when some 100 delegates visited the Whale Fat Follies comedy cabaret-style show. Among the many inventive uses were a light aircraft with Duck tape wings, repairs to damaged vehicles, full waterproof clothing and an unruly child taped to a wall! The cabaret artists also played renditions of several songs using a strange Duck tape powered instrument. Overall, this was a bizarre but very funny ending to my visit to Alaska.

I would like to thank BHS for contributing towards my travel expenses, allowing me to gain insights into the cutting edge work being undertaken by NABS members and to lay the foundations for future international research. But crucially, you have helped me to understand the many uses of Duck tape, beyond my previous experiences in patching up tents and repairing stilling wells and weather stations when on field work!

Lee Brown
School of Geography, University of Leeds

Decision tree for uncertainty analysis methodology: a Wiki experiment

http://www.floodrisknet.org.uk/methods
http://www.floodrisk.net

Uncertainty and risk analysis of models has received increasing attention over the past few decades in hydrological and hydraulic modelling. However, the potential user is always faced with a difficult decision about which of the available methods to choose, especially since there will be a learning curve associated with each method.

There has been some progress in providing guidance on the available methods, and a new website *(http://www.floodrisk.net)* will contribute to these efforts. It provides a *catalogue of uncertainty analysis methods*, some worked examples, and a *decision tree*, helping users choose a method by answering a small set of questions.

There is no universally applicable uncertainty analysis method. Instead there are different philosophies, assumptions and methodologies

Diary

14th–18th August 2006
International Conference on Riverine Hydroecology, supported by BHS
Venue: Stirling University, Scotland
Contact: Dr David Gilvear *(tel 01786 467840, email d.j.gilvear@stir.ac.uk), www.sbes.stir.ac.uk/riversconference*

10th–13th September 2006
9th National Hydrology Symposium
(and BHS AGM on 12th September)
"Land management and the protection of the water environment: understanding the impact of new legislation"
Venue: Durham University
Contacts: Prof. Tim Burt *(t.p.burt@durham.ac.uk)*; Prof. Stuart Lane *(s.n.lane@durham.ac.uk).*

13th–15th September 2006
British Soil Science Soc. Annual Meeting
"Soil, vegetation and climate change"
Venue: University of Leeds
Contact: Pippa Chapman *(p.j.chapman@leeds.ac.uk)* or see *www.geog.leeds.ac.uk/conferences/index.html*

20th–22nd September 2006
ERB2006 – European Network of Experimental & Representative Basins
Venue: Luxembourg
(email erb2006@lippmann.lu, fax +352 470264, web http://erb2006.lippmann.lu)

26th–28th September 2006
3rd International Symposium on Integrated Water Resources Management
Venue: Bochum, Germany
See *www.conventus.de/water* or contact Mrs Jana Radoi *(tel +49 3641 35 33 221, email water@conventus.de).*

11th October 2006
BHS Midlands Section and NERC
"Water fluorescence: novel techniques, new applications"
Venue: Staff House, University of Birmingham
Contact: Dr Andy Baker, University of Birmingham *(email a.baker.2@bham.ac.uk, website http://www.gees.bham.ac.uk/research/fluoronet/activities.htm)*

12th–13th October 2006
Cycleau partnership event
"River basin management and European territorial cooperation"
Venue: Quimper, Finistère, France
Contact: *(email cycleau@environment-agency.gov.uk, tel 01208 265191, website http://www.cycleau.com)*

25th October 2006
BHS South West Section meeting: Presentations by younger hydrologists (but all ages are welcome to attend!)
Venue: Small Lecture Theatre, Queen's Bldg, Bristol University; Time: 2 p.m.
Contact: Dr Dawei Han, Civil Engineering Dept, Bristol University *(tel 0117 928 9738, email d.han@bristol.ac.uk)*

BHS AGM in Durham

The AGM (including an update on Chartered status — see *President's Piece*) will now be on Tuesday 12th September at 14.15 in the University Geography Department, South Road, Durham DH1 3LE.

26th October 2006
BHS South East Section meeting
"Drought — where are we and what's happening?"
Venue: ICE, London, Time: 6 p.m.
Contact: Helen Procter *(tel 01372 754201, email helen.procter@atkinsglobal.com)*

26th October 2006
ICE Wales, BHS & CIWEM joint one-day conference — "Learning to live with flooding in Wales"
Venue: County Hall, Cardiff Bay
Contact: Denys Morgan, ICE Wales *(tel 029 2063 0561, email denys.morgan@constructingexcellencewales.org.uk)*

6th November 2006
One-day joint meeting with Geol. Soc.
"Uncertainty in groundwater models: the utility of models for groundwater management" combined with the 2006 Darcy Lecture by Eileen Poeter (USGS)
Venue: Lancaster University Conference Centre; Time: 10.30–16.00
Contact: Prof. Andrew Binley *(tel 01524 593927, email a.binley@lancaster.ac.uk, www.lec.lancs.ac.uk/cswm/Darcy.php)*

6th–7th November 2006
BHS Postgraduate Symposium
(following on from the meeting above)
Venue: University of Lancaster
Organisers: Postgraduate students Daniel Kaeser and Toby Krueger
Contact: Dr Andrew Crowe *(tel 01524 510231, email a.crowe@lancs.ac.uk)*

14th November 2006
ICE and BHS one-day conference
"Real time flood forecasting: developments and opportunities"
Venue: City Conference Centre, London
Contact: Sophie Hurndall *(see page 19)*

16th November 2006
BHS South East Section meeting
"The EU Habitats Directive and water requirements" — Roger Simpson
Venue: ICE, London, Time: 6 p.m.
Contact: Helen Procter *(address above)*

14th February 2007
NERC/IGBP meeting: "Understanding land-ocean-atmosphere interactions in the climate system: the role of earth observation from space"
Venue: Royal Society, London
Contact: Dr John Gash, CEH *(tel 01491 692331, email jhg@ceh.ac.uk, web http://classic.nerc.ac.uk/IGBP.php)*

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.*
The deadline for abstracts of papers for the IAHS Symposia is **31 August 2006.**

Nominated committee members

As a result of the recent nominations, three new people will be joining the BHS committee at the AGM, and two members will be taking on new roles.

Frank Farquharson (Centre for Ecology and Hydrology), who is already on the committee representing the ICE Water Board, was nominated as President Elect and will take over the Presidency when Rod Hawnt comes to the end of his term at the 2007 AGM.

Dr Hayley Fowler (University of Newcastle upon Tyne) was nominated for Hon. Secretary and will take over from Joe Pearce at the AGM.

There were three nominations for two committee places, but Hayley's move creates a third vacancy, so **Dr Claire Walsh** (School of Civil Engineering and Geosciences, University of Newcastle upon Tyne), **Dr Claire Samuel** (Peter Brett Associates) and **Dr Kelvin Limbrick** (Applied Environmental Research Centre) will all be able to join the committee.

Finally, from our hydro-musical correspondent

Coming soon to a primary school near you could be a musical by Douglas Wootton called *H_2O!* for children aged about 5 to 9 to perform. It comes to a rousing climax with the *Hydrologic Cycle Rag*. It's nice to have our chosen topic penetrating the educational (and arts) world so early!

Frank Law

Copy deadline for *Circulation* No. 91 6th October 2006