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Chilean hydrology

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COVER PICTURE *shows the outlet flume and gauging hut at the La Reina experimental catchment south of Valdivia. The catchment was set up in the mid 1990s in a DfID funded project involving Newcastle University and the then Institute of Hydrology (now the Centre for Ecology and Hydrology) in the transfer of the SHETRAN modelling technology to the Chilean Corporación Nacional Forestal (CONAF). The Universidad Austral de Chile subsequently took over the operation of the station. The objects on the roof are raingauges, not chimney pots. The roof is the only open space available in an rather dense and rapidly growing plantation forest.*

Chilean hydrology

JAMES BATHURST (NEWCASTLE UNIVERSITY)

has been on sabbatical at the Universidad Austral de Chile at Valdivia during April-August 2013, researching the impact of forest plantation on soil erosion. Here he presents a personal view of Chilean hydrology and water resources.

Improbably thin, Chile stretches from within the tropics to Cape Horn at a latitude equivalent to Edinburgh, providing just about every hydro-logical environment except tropical rain forest. North to south, it can be split into the Atacama desert (so dry that NASA uses it as a Mars analogue),a central region grading from Mediterranean climate (Santiago annual rainfall 360 mm) to temperate rain forest (Valdivia 2500 mm) and a cold and even more rainy southern region (over 3000 mm in Patagonia). Water so defines the southern end of the Central Valley that two of Chile's administrative regions are named The Lakes and The Rivers. West-east there are significant variations from the Coastal Cordillera, across the Central Valley and into the Andes, where snowmelt and glaciers form important water sources. Volcanoes and earthquakes add their own hydrological impacts.



Volcán Osorno and the Petrohue Waterfalls.

The climate is strongly affected by the El Niño Southern Oscillation and is characterized by alternating sequences of wet and dry years. Since 2010 the country has been enduring a severe drought, with the last decade being the driest for 70 years. In May 2013, at the start of the austral winter, the nation's reservoirs were on average in deficit by -71% relative to the normal May figure, with many of the irrigation reservoirs at less than 5% capacity. It is predicted that four wet years are needed to recharge them fully.

Agriculture is the main water user (63%), industry takes around 25% and domestic use is around 11%. Some double use of water occurs for hydropower. Most of Chile's reservoirs are for hydropower and irrigation and most domestic water comes from river extraction or wells. Typically the hydropower reservoirs are built and owned by the generating companies while irrigation reservoirs involve much greater state funding. The 1981 Water Code established a framework in which free-market forces and water markets were allowed to trade water rights and enable the reallocation of water to high-value uses, such as fruit and wine. Known as the Chilean Model it had some success in its aims but did not take into account social considerations. In 2005 it was therefore reformed to address social equity and environmental protection concerns, so that for example ecological water flows and sustainable aquifer management must now be considered in the granting of new water rights. Too late, though, for the northern rivers, where the water rights were assigned before the environment was considered a priority. In some cases the sum of the water rights exceeds the available water.

Hydropower is at the centre of energy politics. Chile is long on renewable energy resources but short on conventional hydrocarbon resources and has to import, expensively, these latter fuels. A senior energy executive was recently quoted as saying that "Water is Chile's oil" and indeed hydropower accounts for around 40% of Chile's electricity generating capacity. Energy demand has greatly increased during Chile's recent economic boom and its drive to become a fully developed nation by the end of the decade (it is the only South American nation in the OECD). However, the reduced HEP availability due to the drought and expensive fuel imports have driven up energy prices to the detriment of the country's international competitiveness. The direct relationship between water and energy costs was illustrated by a fascinating calculation in the leading daily newspaper, *El Mercurio*, following the first heavy winter rains in May. The rainfall was translated into a runoff input to the reservoirs, which in turn was quantified as a HEP resource of 180 MW, which in its turn allowed a reduction in marginal energy costs (by replacing supply from the hydrocarbon plants) from US$310 / MWh to US$250 / MWh.



Ferry crossing the Río Baker in Patagonia. The Baker is one of the two rivers that would be dammed in the proposed HidroAysén HEP scheme.

A proposed hydroelectric scheme is also the cause of one of Chile's biggest environmental disputes. The HidroAysén scheme in Chilean Patagonia proposes five dams on two rivers to generate 2750 MW at a construction cost (including the transmission line) of over US$10 billion. On the one hand the scheme would generate much-needed and environmentally clean power and would provide job opportunities and support development in a remote part of the country. On the other, it would devastate two of the world's last few big pristine rivers, would flood large areas (including part



Patagonia without dams! One of the protest posters against the HidroAysén HEP scheme in Patagonia.

of a national park) and, most controversially, would require a 2000-km transmission line driven through some spectacular countryside to carry the electricity to the central and northern regions, presumably with significant losses along the way and open to disruption by a range of geohazards. Critics also contend that Chile's needs can be met by a range of alternative renewable energy schemes, less environmentally disruptive and more broadly based (implying a less vulnerable electricity supply). The scheme received government approval in 2011 but a well-organized and somewhat unexpected opposition has delayed implementation. It is likely to feature in the campaigns for the November 2013 presidential election.

Following a loss of momentum in recent decades, Chile once again has an active reservoir building programme. In March 2013 the government launched its National Water Resources Strategy with the aim of ensuring that water shortages should not be an obstacle to the country's development. Sixteen reservoirs have been proposed for construction by 2021, to increase the national water storage by 30% and secure 170 000 ha of irrigation. As an indication of the growing demand for reliable water supply for agriculture, they include the first two irrigation reservoirs in the southern rainy regions of The Lakes and The Rivers. The Strategy also includes the development of new water sources such as aquifer recharge. Many of the aquifers are drying up through over exploitation and, apparently, reduced infiltration consequent upon soil erosion (so more surface and less subsurface flow) and increasing urbanization (so more impermeable surface).

The conscious decision to concentrate on high value grapes (for wine) and other fruit for export, along with the drought and increasing energy and water costs, is driving changes in both the operation and management of irrigation. In particular, a reliable and efficient water supply is needed if agriculture is to be internationally competitive. The older irrigation canals, built in the 19th and early 20th centuries as simple earth channels, lose 40–80% of their water into the ground and need to be lined. Furrow watering (which still accounts for 40% of irrigation) needs to be replaced by the more efficient drip irrigation. The more advanced irrigation schemes are also applying information technology and telemetry for monitoring water availability and transfers (improving user confidence in their supply), plant and soil moisture needs (for efficient water application) and the Andes snowpack (to predict the summer runoff). At the local level, water user organizations (known as Juntas de Vigilancia) have been banding together to improve their access to finance, overcome political and institutional obstacles and allow more efficient water management, especially at times of shortages. At the national level it has been suggested that water resources administration (currently spread over several government departments) should be centralized to allow a more integrated and efficient management.

Increasing water demand has generated a range of allocation problems. The increasing amount for irrigation is diverting water from aquifer recharge, ecosystem services and downstream wetlands. In the desert north the demands of the mines (which account for over 40% of Chile's export earnings) conflict with domestic, agricultural, ecological and indigenous population needs. To avoid environmentalist censure, one mining company has started to pump desalinated seawater from the coast rather than deplete the local aquifer.

Pollution of rivers with mining waste is also an issue and one large development has recently been suspended until it builds satisfactory infrastructure for preventing such pollution. In the south the realisation that the extensive forest plantations can significantly affect runoff quantity and quality is driving the development of Best Management Practice and environmental certification criteria for the forestry companies.

Detecting signs of climate change is hampered by the large interannual fluctuations in conditions and also a lack of hydrometeorological stations in the Andes. The overall prediction, though, is for less rain and higher temperatures and many of the Andean glaciers are indeed in retreat. Along with the glaciers, the winter snowpack is a crucial water resource. It enables water to be stored at the time of greatest precipitation (the winter) and released at the time of greatest irrigation need (the summer). However, warming temperatures will mean less precipitation falling in solid form and melting taking place before the irrigation season, thus reinforcing the need for more storage reservoirs.

As for Valdivia, it was the scene of an early British assessment of forest hydrology. In Spanish colonial times it was an important stronghold,

protected at its sea entrance by formidable fortifications. However, in 1820, the nascent Chilean navy, under the command of a Scot, Lord Thomas Cochrane (apparently a model for C.S. Forester's fictional hero Horatio Hornblower), stormed the forts to gain a famous victory, effectively ending Spanish power in the south and paving the way for Chilean and Peruvian independence. Flushed with success, Cochrane wrote to the Chilean independence leader, Bernardo O'Higgins, of the Valdivian region that "the climate is moderate and delightful and if the country were to be cleared of forest, the warmth of the ground would dissipate the moisture, eliminating the rain storms about which people seem to complain; the temperature of course is better than in England....". He was right about the temperature but the winter rains seemed interminable. Must be the effect of all that plantation forest!



Corral fort, one of several that guarded the estuary entrance to the Valdivia River from the Pacific.

Most of the above information was taken from Wikipedia and *El Mercurio*, which regularly discusses water-related issues and which endeared itself to me by once publishing a special supplement containing Manning's flow resistance equation. I thank Andrés Iroumé (Universidad Austral de Chile), Alejandro Dussaillant (University of Greenwich and Centro de Investigaciones en Ecosistemas de la Patagonia) and Claudio Meier (Universidad de Concepción) for additional information and for checking what I have written but I remain responsible for any misrepresentation. I also thank Andrés as my host at the Universidad Austral de Chile, Chile's Comisión Nacional de Investigación Científica y Tecnológica (CONICYT) (MEC contract 80120037) as my financial sponsor and my colleagues at Newcastle University (who took on my duties) for enabling me to undertake such a fascinating and enriching sabbatical.



James (wearing serious weather protection) at a gravel-bed river in the Coastal range near Valdivia. The site is operated by the Universidad Austral de Chile;the picture shows some bed load sediment transport traps.

New members

Nicole Archer.....British Geological Survey, Edinburgh
Hanna Barker.....Envirocentre Ltd., Glasgow
Emma Luise Bird.....Canal & River Trust, Tamworth
Katie Burton.....Independent Consultant, Llnfairfechan
Zdenka Chalmers Zarzycka.....Glasgow
Alexander Jon Clapham.....University of Edinburgh
Tim Foster.....Imperial College London
Mohammad A Hoque.....Imperial College London
Timothy Jones.....University of Lancaster
Thomas Kriechbaumer.....Cranfield University
Jason Jessels.....University of Aberdeen
Joanna Matthews.....Aberystwyth University
Balqis Mohamed Rehan.....University of Oxford
Hannah Peacock.....Environment Agency, Leeds
Rebecca Price.....Great Missenden
William Rust.....Atkins, Epsom
Christopher Simpson.....Dundee
Hannah Kathleen Tankard.....Environment Agency, York
Georgia-Marina Tsarouchi.....Imperial College London

The role of the Hydrologist when acting as an Environmental Clerk of Works

THE ASSOCIATION OF ENVIRONMENTAL & Ecological Clerks of Works (AEECoW) was formed 18 months' ago as a qualifying body supporting professionals in the role of auditing environmental and legislative compliance of development projects. This article is aimed at raising awareness to hydrologists as to the factors when acting as an Environmental Clerk of Works (EnvCoW).

Background
AEECoW's core objectives are to:

- Act as a qualifying body which seeks to raise professional standards through peer review of members;
- Promote the role of ECoW as key members of development teams;
- Provide training to industry professionals to undertake the ECoW role;
- Develop a programme of continuous professional development (CPD) and promote good practice;
- Create a network to facilitate the exchange of good practice between the environmental and development industries; and
- Provide a forum for providing feedback to national and local government, regulators and NGOs on ECoW issues.

The requirement for ECoWs has grown significantly over the last few years, principally for large development projects such as wind farms, hydro-electric projects, road and rail construction, harbour and airport developments. Their expertise ensures that the processes for implementation of an environmental impact assessment contained in a development's planning conditions are audited and assurance is given that the development is compliant. The role of an ECoW can involve a range of disciplines, including hydrology, contaminated land pollution, noise and vibration, and can also include ecological skills in protected species, habitats, woodlands, birds and invasives. The latter role is usually undertaken by an Ecological Clerk of Works (EcoCoW).

There is a fundamental need for those working as environmental specialists to be able to understand the construction process and for those working as construction and development professionals to be able to understand the importance of the environment as it relates both to water, air, land and ecology. On most large-scale development projects, several EnvCoW and EcoCoWs will be deployed as each project may have environmental planning conditions involving a specialism.

Case Studies
The following three case studies show the relevant work of the Environmental or Ecological Clerk of Works. Each case study would involve the skill of a hydrologist where flooding, drainage or impact on the water environment is assessed as an environmental issue in the Environmental Impact Assessment (EIA).

Kirkintilloch Link Road

EcoW Consultant: EnviroCentre Ltd
Location: Kirkintilloch, East Dunbartonshire (Scotland)

Project Details: The project included the construction of a c.5 km new road, linking the centre of Kirkintilloch to the M80 to the south. The scheme included the realignment of two watercourses, construction within ecologically-important wetland habitats and extensive mitigation for protected species.





Sensitive Ecological / Environmental Features: Protected wetland: Ancient woodland; Rivers and streams; Water vole (*Arvicola terrestris*); Otter (*Lutra lutra*) Breeding birds; Invasive species.

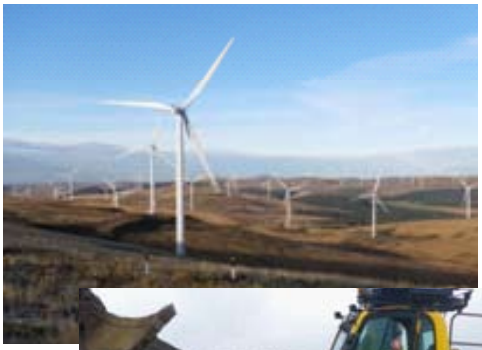
ECoW Context: The complexity of the site's ecological features gave rise to extensive and complicated mitigation measures via an EIA. These mitigation measures formed the basis of a Biodiversity and Habitat Management Plan (BHMP) which set out a detailed series of objectives to help achieve a reduced impact on ecological features during and after construction. During the planning stages, East Dunbartonshire Council and other stakeholders determined that the most appropriate means of ensuring delivery of the BHMP was to have a Planning Condition requiring the presence of an ECoW throughout construction.

ECoW Role: The ECoW team included specialists in ecology, hydrology, noise and air quality. The nature of their work varied with season and construction phase and involved:

- toolbox talks for construction teams;
- review of method statements and construction plans;
- protection of sensitive areas;
- delivery of ecological enhancement plans;
- regular protected species surveys;
- on-site surface water management/ pollution prevention advice; and
- on-going community liaison (incl. guided walks and talks to local interest groups).

Clyde Wind Farm

ECoW Consultant: Land Use Consultants (LUC)
Client: SSE Renewables





Location: Southern Upland Hills between Biggar and Moffat, South Lanarkshire

Project Details: 152 turbine on-shore wind farm

Sensitive Ecological / Environmental Features: Blanket bog; Dry and wet dwarf shrub heath; Unimproved acid grassland; Watercourses; Otter; Badger; Mountain hare; and Red squirrel

ECoW Context: LUC provided full-time ECoW services during construction of Clyde Wind Farm. This represented a natural extension of LUC's work in providing ecological assessments of the project during the EIA and pre-construction phases.

ECoW Role: During construction, LUC ECoWs worked closely with SSE Renewables engineering teams and contractors to monitor impacts on watercourses and water-dependent habitats, to provide guidance on best working practices and ongoing drainage design revisions, and to help resolve ecological and environmental concerns as they arose. ECoW tasks included:

- Checks for sensitive habitats (in particular blanket bog) and protected species (otter, red squirrel, badger, reptiles and mountain hare) immediately in advance of soil stripping during access track and turbine base installation.
- Monitoring of nesting birds (carried out alongside the Ornithological Clerk of Works for the project).
- Establishment and monitoring of safeguard zones around otter shelter locations, red squirrel dreys and badger setts, with application for licensing from Scottish Natural Heritage (SNH) as required.

- Minimisation of impacts on sensitive habitats such as blanket bog, by advising on appropriate micro-siting of wind farm infrastructure, within the permitted 50m tolerance zone.
- Advising on minimisation of disturbance to peat habitats, by guiding work teams during stripping of track routes and turbine base areas, and reinstatement of areas adjacent to works.
- Coordination of environmental monitoring and mitigation activities between SSE Renewables, contractors and consultants, and liaison with regulators including the Scottish Environment Protection Agency (SEPA) and SNH.
- Production of monthly reports highlighting ecological and environmental concerns on site, and measures taken to resolve these.
- Liaison with the site Habitat Management Plan officer to ensure that reinstatement of works areas was consistent with long-term management plans.

Forth Road Crossing

ECoW Consultant: EnviroCentre Ltd

Project Details: New road crossing over the River Forth

Sensitive Ecological / Environmental Features: SSSI; Water courses; Supervision of vegetation clearance and tree felling during nesting bird season; Notable plant species; Protected faunal species (otter, bats, badgers, nesting birds); Protected Species Disturbance Licence (Otters); Invasive species (Japanese knotweed).

ECoW Context: On-site supervision and advice on mitigation during ground investigations to protect ecological sensitivities. Controversial development.

ECoW Role: Provide on and off site support to contractor; Report to contractor, main client and liaise with the statutory agencies; Manage European Protected Species Disturbance Licences.



Location: Kirkliston (Edinburgh) to Inverkeithing (Fife)



Conclusion
It is clear that major developers will want professional EnCow and Ecow roles to be filled by qualified personnel. The purpose of AEECoW is thus to ensure that professional standards are applied. Hydrologists play an important part in development projects and will become increasingly involved in the role of ECoW.

For further information contact:

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BHS
Annual General Meeting

The 31st AGM will be held at the University of Birmingham on **11th September 2013**, from 12–1pm (during the National Meeting, 'Wetland Hydrology'). Please see separate flyer for Agenda and also please note the following:

Amendments to the BHS Statutes

Included with this issue of *Circulation* and the papers for the AGM to be held at University of Birmingham in September are two items relating to the Statutes of your Society: the first being a draft of the revised Statutes, and the second being a voting paper. The Statutes (item 11) require that such changes can only be made with a majority of three-fifths of those Members voting in a postal or electronic ballot.

Please support your Society, and your Committee, by voting to accept the proposed amendments and returning the form either by post or e-mail to Tim Fuller, Secretary, British Hydrological Society, c/o The Institution of Civil Engineers. One Great George Street, Westminster, London SW1P 3AA (Tim.Fuller@ice.org.uk) before 2 September.

Balancing the annual budget – BHS Fees

Also included amongst the papers for the AGM are a draft budget and a paper from the Hon. Treasurer explaining proposed increases in various fees levied by the Society.

The costs of activities of the Society in supporting Members through various grants and bursaries have increased dramatically in recent years whilst our income has remained reasonably steady and fees have not increased for ten years or more. For the past three years the resultant deficit in the annual budget has been offset by a managed reduction in BHS reserve funds, designed to bring reserves down to a level closer to our annual expenditure and to meet concerns expressed by the Charity Commissioners that the level of reserves was too high for the activity of the Society.

If you have any questions or concerns about the proposed changes please contact Nigel Goody, Honorary Treasurer & President Elect, c/o SEPA, 7 Whitefriars Crescent, Perth, PH2 0PA (nigel.goody@sepa.org.uk). Fees charged for services provided by the Society can be set directly by Committee but Statute 6 requires that any changes to Membership Dues have to be agreed by a simple majority at the AGM. Please support your Society and your Committee by attending the AGM, if possible, on 11 September and giving your approval to these proposals.

Peter Wolf Early Career Hydrologist's Event

Imperial college
25–26 March 2013



THIS ANNUAL EVENT ALLOWS EARLY STAGE researchers and junior consultants from industry to meet up and discuss their work in an informal setting, getting to know others in the field and developing writing and presentation skills for their future careers. The event is named in honour of Peter Wolf, a pioneering hydrologist and founder of the Imperial College Hydrology MSc Programme, so this year's event represented something of a homecoming. The event was held in the Environmental and Water Resource Engineering Section and organised by Zed Zulkafli and Mike Simpson.

The delegates comprised early career researchers from UK universities, research institutes, and water consulting companies. Non-UK delegates, travelled specially from ETH Zurich, the University of Belgrade, Serbia, and the Indian Institute of Science, Bangalore.

All in attendance actively participated in discussions during the oral and poster sessions and conversations continued over the tea breaks. Everyone was treated to a three-course evening meal at the Radisson Vanderbilt hotel, where most were accommodated for the night.

The symposium saw Prof. **Howard Wheater** back at Imperial College to give a keynote speech, in which he talked about his current role in the Canada Excellence Research Chair in Water Security. His discussion on the ongoing research activities at the University of Saskatchewan gave a different perspective on the topics of interest and what are at stake in North America; for example, algal blooms of immense magnitude and different regulations by states that results in legal issues at the borders. The second keynote speaker, Dr. **Eleanor Blyth**, a land-surface scientist at the UK Centre of Ecology and Hydrology (CEH), gave an engaging talk on her engineering education, the choices she made throughout her career, and bridging between corporate and independent working styles in her current position at CEH. **Bob Sargent**, BHS President, closed the event and gave prizes for the best posters and presentations (see above right). In all, the event was social and successful.

Special thanks to the British Hydrological Society for providing generous funding and to Imperial College staff (Angela Frederick, Fionnuala Ni Dhonnabhain, Steve Hullock, Dr. Wouter Buytaert, Gianluca Guadagno, Fu Mei Chen and Caroline Detchenique) for ensuring a smooth-running event.

Zed Zulkafli and Mike Simpson

Prize Winners were :
1st Prize, Presentation – Susana Ochoa (Imperial College);
2nd Prize, Presentation – Andrew Chiverton (Centre for Ecology and Hydrology);
1st Prize, Micro Presentation – Jon Mackay (British Geological Survey);
2nd Prize, Micro Presentation – Jonny Ritson (Imperial College);
1st Prize, Poster – Simon Moulds (Imperial College);
2nd Prize, Poster - Valentina Noacco (University of Bristol) .



Photo: Helen Moggridge

Urban Aquatic Ecosystems

Joint BHS and Royal Geographical Society Biogeography Research Group meeting 10 April 2013

THERE IS INCREASED RECOGNITION OF THE value of urban waterbodies as a refuge for biodiversity and provider of ecosystem services. As a result, these important ecosystems have received greater attention from academic research and conservation agencies in recent years. In response to this expanding field, BHS and the Biogeography Research Group convened a one day meeting to share knowledge and best practice. The meeting had a full and varied programme and was well attended, with over 60 delegates that included both scientists and practitioners.

The meeting opened with a keynote address from **Robert Francis** and **Michael Chadwick** (King's College London) on urban rivers as novel ecosystems. Drawing on research on the River Thames in central London, the paper considered the extent to which urban rivers are 'novel' (i.e. have no natural analogue) and the potential value of this, demonstrating how some remediation measures (e.g. planting of engineered walls) can enhance biodiversity. This was followed by a presentation from **Lucy Shuker** (Environment Agency) who demonstrated the application of the Urban River Survey method for assessing Good Ecological Potential as part of Water Framework Directive requirements for heavily modified waterbodies.

The first session concluded with **Jim Rouquette** and others (Environment Agency and University of Sheffield). Jim presented the findings of an extensive biodiversity survey along the River Don (Sheffield) on the different modes of connectivity for different taxa. The relationship between biodiversity and human well-being along the river

corridor was also highlighted.

The second session of the day was broader in scope, considering urban ponds as well as rivers. A keynote address from **David Gledhill** and **Philip James** (University of Salford) on 'thinking outside the pond: a wider urban landscape perspective' opened the session. David reported findings from an extensive survey of ponds within Halton (north-west England) and demonstrated the importance of landscape setting (including, for example, land use and housing type) on the biodiversity of ponds and considered the future of urban ponds in the face of climate change and urban intensification. This was followed by **Anne Robertson** (Roehampton University) who described trends in micro-invertebrate community establishment and succession on the Jubilee River flood alleviation channel (River Thames) and outlined the application of the findings for future restoration projects. **Matthew Hil**l and **Paul Wood** (Loughborough University) followed this with a presentation on observed trends in pond macro-invertebrates along a rural-urban gradient, showing how factors such as the presence of vegetation can strongly influence biodiversity in artificial urban ponds.

The final talk of the morning, from **Samantha Jane Hughes** and others (University of Trás os Montes e Alto Douro), presented the findings from an extensive ecological survey of the Rio Corgo (Portugal), which included habitat preference curves for key fish species. This showed the influence of key urban characteristics on river ecology and concluded with a range of restoration recommendations.

Lunchtime refreshments were kindly provided by the Centre for Hydrological and Ecosystem Science (Loughborough University) and allowed delegates an opportunity to discuss the papers from the morning sessions and to view the poster presentations. The posters complemented the talks perfectly, covering a diversity of topics, including: invasive species (**Ed Willis-Jones** *et al*. and **Mantzorou** *et al*., Queen Mary University of London and Environment Agency), long-term trends in ecosystem status (**D. Chat** *et al.* University of Southampton and Environment Agency; **Shaun Maskrey**, University of Nottingham), responses to restoration (**Nick Elbourne**, River Restoration Centre; **Ben Smith** and **Michael Chadwick**, King's College London) and approaches to management (**Edward Shaw** *et al*., University of Sheffield; **Charlotte Hall** *et al.*, Earthwatch Institute and University College London).

The afternoon session of the meeting began with a keynote address from **Helen Proffitt** and others (Canal and Rivers Trust) on long-term ecological and water quality changes in canals of the Industrial Midlands, which considered the past, present and future management of canal systems. Helen also drew comparisons between the Birmingham and Ashby canals, to assess the impact of the urban environment on the character of canals.

This was followed by a talk from **Robert Mansfield** and others (University of Manchester and APEM) on a different artificial urban ecosystem — Salford Quays in Manchester. Robert discussed the findings from an intensive monitoring programme in the Quays, which provided important insights into the success of different management techniques.

The next talk by **Iain Boulton** and others (London Borough of Lambeth and Environment Agency) was on a similar theme and evaluated the successes and lessons learned from river restoration in London. These included a case study in Clapham Common, where improvements in water quality and invertebrate communities were observed following restoration works. **Suzanne McGowan** and others (University of Nottingham and St Mary's University College) then discussed the responses of lakes in the Attenborough Nature Reserve (Nottingham) to changes in connectivity and considered the implications of this for future management.

The session continued with a talk from **Simon Turner** and others (University College London), who presented the findings from the national OPAL monitoring programme, with some reflections on community engagement in environmental monitoring. The concluding presentation was by **Chih-Wei Tsai** and others (University of Sheffield) which clearly demonstrated that rivers can have a cooling effect in urban environments, as shown by variation in phenology in ash and sycamore trees in riparian and non-riparian areas along the River Don.

The meeting showcased the breadth of current activity in research,

monitoring and restoration of urban aquatic ecosystems, enabling the sharing of knowledge and best practice. Our understanding of these systems has advanced tremendously, but there are still many lessons to be learnt, with every study and/or restoration project making an important contribution to the field. This factor was demonstrated in all the presentations and in the questions and lively discussion which followed.

The meeting organisers would like to thank the British Hydrological Society and the Biogeography Research Group for sponsoring the meeting and for support from the Centre for Hydrological and Ecosystem Science at Loughborough University.

Helen Moggridge
University of Sheffield

EGU General Assembly

Vienna, Austria
7–12 April 2013

ZED DIYANA ZULKAFLI TRAVELLED TO VIENNA to attend the EGU General Assembly for the first time. The following, listed chronologically, are some highlights of the sessions related to hydrological modelling, precipitation uncertainty and remote sensing, and climate change.

Session HS2.6 Hydrological change: Regional hydrological behaviour under transient climate and land use conditions

Nans Addor from the Department of Geography, University of Zurich, presented an analysis of the uncertainty contributed by emission scenarios, climate models, climate projection downscaling, and the hydrological models in a climate change study in hydrological basins across Switzerland. He found through the analysis of variance (ANOVA) that the emission scenarios contributed to the largest uncertainty in catchment-scale climate change studies. **Douglas Maraun** presented a new research network called VALUE, which stands for Validating and Integrating Downscaling Methods for Climate Change Research, and is an initiative of the EU Cooperation in Science and Technology (COST) whose aim is to provide an open platform for systematical validation and downscaling methods for regional climate change research. He called on the audience for participation through the network website: **www.value-cost.eu**. **Georgia-Marina Tsarouchi** from Imperial College London presented her PhD research on the land use changes in the Upper Ganges. By training data from MODIS (the Moderate Resolution Imaging Spectroradiometer) in a supervised classification, she generated historical land use/land cover (LULC) maps and applied a Markov Chain model that predicts future LULC, based on past trends. These scenarios of land use are later fed into a hydrological model to evalute the changes to the basin responses.

Session HS3.1 Hydroinformatics: computational intelligence, systems analysis and optimisation

Claudia Vitolo from Imperial College London presented a data-mining framework for selecting hydrological model sets (structures and parameters) in an objective fashion. She uses an ensemble of conceptual models (FUSE), and a series of performance scores that ranks each model set by its robustness and multi-objective performance, and goes further to reduce model redundancy using cluster analysis and dynamic time-warping methods. **Mark Wilkinson** from the James Hutton Institute, Aberdeen, demonstrated a deliverable of the Environmental Virtual Observatory Pilot project (EVOp, a UK Natural Environment Research Council initiative in the form of the Local Landscape Visualisation Tool to communicate flood risk to farmers.

Session HS1.2 Data & Models, Induction & Prediction, Information & Uncertainty: Towards a common framework for model building and predictions in the Geosciences
The PICO (Presenting Interactive Content) is a new presentation format this year and combines both an oral and a poster component. Each presenter is given two minutes in which to introduce their research to the audience, who has an anytime access to all electronic posters via touch-screen displays in the PICO spots nearby. **Claudia Vitolo** on behalf of **Wouter Buytaer**t from Imperial College London presented a poster on hydrological modelling in a 'big data' era.

Session HS3.2 Geostatistics for space-time analysis of hydrological events
Eric Wood from the University of Princeton presented some work completed in Central Africa combining bias-corrected reanalysis data with ground observation data in a Bayesian approach. At the end of the session, he shared his thoughts on the problem with data access restrictions, common in developing countries, that does not promote transparency in hydrological research.

Session HS7.1/AS1.5/NH1.2 Precipitation: from measurement to modelling and application in catchment hydrology
I presented my PhD work on improving the rainfall representation of the north Peruvian Andes, for large-scale hydrological modelling applications. It is a comparative perfomance analysis of the mean bias correction and a Bayesian combination approach to merge rain gauge and satellite estimates from the global TMPA dataset (Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis), evaluated using a hydrological model (Joint-UK Land Environment Simulator coupled to a routing model). Following the meeting, I had very interesting discussions with **Marla Angulo Martinez** from Duke University and **Bharya Bittarcharwa** from UNESCO-IHF who work with TMPA in similar regions in Ecuador and Peru. On the second day, **Vera Thiemig** from the EU-Joint Commission presented her analysis of six satellite precipitation products over Africa. She showed that TMPA is underperforming compared to CMORPH in mountainous environmens while the reverse is true for lowland basins in Africa, and suggested that poor IR-based estimations may play a role.

HS10.9 Redistribution of rain in forests: Patterns, processes, and interactions at the soil – atmosphere interface
Susanne Wiesne from the University of Potsdam presented her field experiments on canopy drip rate in Panama to demonstrate that common throughfall models that assume no drainage occurs before the canopy is full may be flawed.

Session NP2.1/AS1.20/CL4.12/ OS1.6 ENSO: Dynamics, Predictability and Modelling
Mojib Latif from the Helmholtz Centre for Ocean Research in Kiel, Germany, presented a talk on Super El Niños, described as having strong anomalies and a longer persistence, which develop because of strong westerlies developing in the west Pacific that drives heat convergence. **Eric Guilyardi** from L'OCEAN-IPSL, Paris, gave an insight into the ENSO (El Niño Southern Oscillation) representation in climate models from phase 3 to phase 5 of CMIP (Coupled Model Intercomparison Project). He showed that, statistically, the representation of ENSO improved in CMIP5 with sea surface temperature errors reduced by 30%. However, a closer look indicated that the improvement are due to error compensation while feedbacks are still poorly modelled.

Session HS7.2/AS1.6/CL5.13/ NH1.3/NP3.8 Precipitation uncertainty and variability: observations, ensemble simulation and downscaling.
Maria Sunyer from DTU Denmark presented several methods to account for the nonstationarity in the model bias and model interdependency in regional climate model predictions in an application to Denmark. She highlighted that by neglecting these two factors, one may be inadvertently double-counting information.

Session NP3.5/AS4.7/CL5.1/ HS8.1.10 Geophysical downscaling methods
Douglas Maraun answered the question of whether quantile mapping (including the reduced form delta change) is an appropriate method for downscaling and showed that the

method overcorrects the area-drizzle effect and inflates area extremes.

AS1.4/CL2.11/HS12.1 Precipitation: Measurement, Climatology, Remote Sensing, and Modeling

Markus Ziese from the German Weather Service presented existing and new datasets from the Global Precipitation Climatology Centre (GPCC) that include the real-time 'First Guess' and 'Monitoring Product' and non-real-time 'Full Data Reanalysis', 'Climatology', 'VASClimO' and 'GPCC–Drought Index (GPCC-DI)'. **Misako Kachi** from the Japanese Aerospace Exploration Agency presented the current status of the Global Precipitation Measurement (GPM) mission. The GPM satellite is scheduled for launch in autumn 2013. **Minda Le** from Colorado State University presented a new rain-drop-distribution for the GPM mission that uses two band radar reflectivity. **Viviana Maggioni** from the University of Maryland proposed a probabilistic error model for TMPA estimates based on the relationship between TMPA and ground observed precipitation, separating cases of false alarm and missed rain.

Overall, the conference was a positively overwhelming experience, and for this, I have my supervisors and research collaborators to thank, i.e. **Wouter Buytaert** and **Christian Onof** from Imperial College, **Waldo Lavado** from SENAMHI (the Peruvian National Institute of Meteorology and Hydrology) and **Jean-Loup Guyot** from the France Institute of Research for Development (IRD) in Peru. I am also very grateful to the BHS for providing a generous travel grant to enable my week-long stay in the beautiful city of Vienna. Thank you.

Zed Diyana Zulkafli
Imperial Collage London

Impact of changes in the hydrological cycle

Joint RMetS/BHS meeting
19th June 2013

CHANGES IN THE WATER CYCLE AFFECT WATER availability and hence livelihoods. This joint National meeting between the Royal Meteorological Society and BHS was held at the Reading University.

Flooding is a hazard to which people living on small islands, low-lying and coastal regions are particularly susceptible. **Paul Bates** (Bristol University) described possible changes in flood occurrence in a warming world and the challenges of predicting floods using highly uncertain output from the climate/hydrological models. Although there is emerging evidence of more floods in a warmer climate, making robust predictions at small spatial scales is difficult because the response of individual river catchments to the weather varies. The uncertainty is exacerbated by wide confidence intervals in the forecast of return periods of floods and a lack of stream-flow observations for calculating the risk. These issues pose challenges for decision-makers responsible for estimating the cost of the impact. A first step in making more reliable planning decisions would be to characterize the sources of uncertainty.

A major part of the uncertainty in flood models arises from errors in the input data from climate models. The capacity of a very high resolution Regional Climate Model (RCM) to simulate the extreme rainfall over the UK and, hence, discern how extreme rainfall responds to global warming was discussed by **Hayley Fowler** (Newcastle University). A challenge for climate modelers is to improve model simulations of both the frequency and intensity of high-rainfall events, by simulating the relevant processes accurately. These processes include local-scale clouds, storm dynamics, orographic

forcing and large-scale circulation. Hayley illustrated these challenges using case studies of simulations of southern UK floods, including the Boscastle event in August 2004, using RCMs of varying resolutions from 12km to 1km. The 1km and 1.5km models which resolve/permit convection reproduce the structure and diurnal variations of the events better than the 12km one, which uses convective parameterisation, although some sources of error persist.

Observational uncertainty arising froObservational uncertainty arising from sparse historical rainfall measurements was explained by **Peili Wu** (Met Office). He showed how a process-based hydrological metric called hydrological sensitivity can be used to evaluate climate models, and demonstrated a linear relationship of changes in global means of temperature and precipitation to increasing atmospheric CO2 levels. The linear relationship breaks down when responses due to anthropogenic aerosols are also considered. However, observed and simulated historical global-mean precipitation does not show the clear increasing trend expected in a warming world. Peili then demonstrated that a climate model which included anthropogenic forcing of tropospheric aerosols and/or greenhouse gases reproduces precipitation changes in opposing directions – largely cancelling out the effects and leading to an apparently low net trend, as also seen in the observed global hydrological cycle. Although model resolution leads to better dynamics, issues related to clouds, aerosols, ice, land-surface representations, external forcings and unknown processes still pose challenges.

One of the most vulnerable regions to climate change and variability is Africa. **Emily Black** (Reading University) presented an example of how continuing environmental monitoring together with climate-hydrological-crop modelling and stakeholder engagement can increase climate resilience. By June 2011, as a result of below-average rainfall from March to May, there was a food security emergency over the Horn of Africa and ten million people needed humanitarian assistance. Lack of access to credit is a barrier for farmers seeking to adapt to climate variability and change.

Emily introduced a case study of how weather-based index insurance can help African farmers survive loss of crops arising from changes in rainfall patterns. Because of high regional/local variations in rainfall over/within different regions, and observational uncertainty arising from sparse rain-gauge data coverage, scalability remains a big hurdle in pricing the index (rainfall threshold) and operating the policies. Another issue is that agricultural losses (crop failure) are not entirely dependent on the insured variable (rainfall from a particular gauge). Such financial products can potentially reduce vulnerability only if the contracts are designed with users and operated with locally reliable rainfall products — potentially including locally calibrated satellite-based rainfall estimates. She stressed the importance of user engagement in increasing confidence in remotely-sensed, real-time, very high resolution rainfall products like TARCAT (http://www.met.reading.ac.uk/tamsat/about/). This talk was dedicated to the memory of David Grimes.

A global to regional to local perspective of how to translate weather and climate information into relevant and usable hydrometeorological services was given by **Jane Strachan** (Met Office). Services based on high-quality climate information have a huge potential in enabling better-informed decisions that are beneficial to society. These services can be based on historical information, forecasts for the coming months to years, or longer-term projections of climate change for decades ahead depending on user needs. Jane pointed out water resource management as one of the four priority areas of the Global Framework for Climate Services, and presented case studies ranging from the Nile project to the Thames Estuary. A theme of the talk was how a user-driven and partnership approach is key to delivering cutting-edge services.

An important question for adaptation, but rarely asked or addressed by physical climate scientists, 'What won't change in response to anthropogenic forcing?' was considered by **Scott Power** (Bureau of Meteorology, Australia). He identified many regions where projected precipitation changes in the late twenty first century are small relative to natural internal variability rather than uncertain, as is widely assumed. This discovery points to a stronger consensus on projections than previously appreciated and highlights the opportunity for climate scientists to provide more information than they do currently. In the

second part of his talk, Scott presented a homogeneous, ongoing record of floods, associated weather events (such as La Niña and tropical interactions) and death tolls in southeastern Australia for the last 150 years and concluded that the worst may be yet to come.

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Data-based mechanistic methods for hydrological modelling, forecasting and emulation: research and water sector applications

Lancaster University
11 July 2013

JULY 11TH WAS A SUNNY DAY IN LANCASTER (really, it was!), despite which a determined group of hydrologists gathered at the University to discuss the Data-Based Mechanistic (DBM) Modelling methodology first formulated by Peter Young, Professor at Lancaster since 1981. The meeting was opened by **Keith Beven** (Lancaster) who acknowledged the co-convenors **Nick Chappell** and **Ian Littlewood** for having had the original idea for the meeting. He then gave a brief history of his collaboration with Peter Young on DBM applications, which have included the Aggregated Dead Zone model for solute transport and pollution prediction in rivers, soils and groundwaters, rainfall-runoff modelling, flood and low flow forecasting, the emulation of complex models, and analysis of change in runoff production. He noted the limitations of physically-based concepts in hydrological modelling and suggested that the DBM approach might be one way of developing better empiricisms for use in next generation models.

The history of the DBM concepts was then outlined in more detail by **Peter Young**, starting with its original conception in the early 1960s up to his recent article in *Water Resources Research* (2013, doi/10.1002/wrcr.20068, see below for access to manuscript version). Peter pointed out that the defining aspects of the DBM modelling philosophy are that the model structure should be inferred inductively from the available time series data to avoid undue prejudice about the nature of the model; and that both the resulting model and its parameters should be capable of interpretation in physically meaningful terms. He introduced two recent extensions of DBM modelling, concentrating on 'hypothetico-inductive DBM' (HI-DBM) modelling, where the DBM model is systematically modified to include hypothetical conceptual elements. This was illustrated by the development of HI-DBM models for the Leaf River (with its rather atypical transfer function characteristics): these demonstrated how the HI-DBM approach could improve the performance of conceptual models, such as HYMOD, both in simulation and forecasting, as well as helping in diagnosing limitations in such models.

Neil McIntyre, (back from his new position in Brisbane), then introduced the idea that the transfer function need not be linear, but that by imposing a mass balance

constraint, the nonlinear component of the DBM approach could be extended to both the effective input and the transfer function. He showed how this could lead to better results using the data from the Pontbren catchments in Wales, but stressed that the approach was rather dependent on having good quality data available.

Barry Croke (ANU, Canberra) then gave a demonstration of how Fourier analysis methods could be used in data analysis as a way of defining the types of nonlinearity required to represent catchment responses, including the use of a constrained deconvolution to obtain series of effective rainfalls. **Nick Chappell** (Lancaster) showed how, as part of the NERC DURESS project on hydroecological responses in the Llyn Brianne and Plynlimon catchments in Wales, high resolution data could be used with continuous time DBM modelling methods to give very good predictions of both hydrographs and pH in these catchments.

Ian Littlewood (formerly at CEH), refering to collaborative published work with Barry Croke and Peter Young, showed there was close agreement between Unit Hydrographs identified for the Wye at Cefn Brwyn using the discrete-time IHACRES and continuous-time DBM methods — provided that hourly data are used for IHACRES. Using daily data, the IHACRES quick flow decay time constant was estimated with good precision (about +/-2%), but was massively inaccurate (by more than +400%) relative to the same model parameter estimated using hourly data. The other (four) IHACRES parameters estimated using daily data were less precise but more accurate. Results from a paper in the latest issue of *Hydrology Research* (see below) were described, allocating loss of information due to using longer time steps for either rainfall or discharges. The implications of this were outlined in the context of possibly reducing uncertainty when any discrete-time rainfall–streamflow model is applied (a) for parameter regionalisation where flashy catchments are included in the set of gauged basins considered and (b) to asist with water quality hydrology.

Where nonlinearities are important, as in representing catchment responses in many applications, the extrapolation of predictions outside the range of the calibration data can be an issue. This was illustrated by **Mike Vaughan** (Environment Agency) using DBM models of the Footholme Gauge in the Forest of Bowland. Using the same nonlinear transfer function formulation as Neil McIntyre, he showed that this made better predictions for higher flow peaks than in the calibration period, and also meant that the inferred effective rainfalls were more often less than the recorded rainfalls.

Paul Smith (Lancaster) illustrated the use of DBM methods in real-time forecasting for both flash flood (Versasca in Switzerland) and tidal cases (River Dee at Carlisle). He also demonstrated ways of using forecasts to feedback to the nonlinearity (though this might not always give stable forecasts so should be used with care) and a nonparametric way of treating the forecast errors. **Sarah Halliday** (Reading) then returned to high frequency water quality, in this case for the Earborne in a more agricultural and semi-urbanised environment where effluents, uncertain domestic discharges and diffuse pollution have an effect on water quality. Sarah reported on the initial analyses of this rich data set, including the nature of diurnal fluctuations and the conditions for the occurrence of algal blooms in the river.

The final talk was given by **Wlodek Tych** (Lancaster) who described a set of Matlab tools for using DBM models as emulators of more complex simulation models. He demonstrated the tool with the example of the OTIS river mixing model, showing how a DBM emulator gave very accurate and fast reproduction of the full model.

This meeting was followed the next morning by a hands-on workshop to demonstrate the methods. The meeting and workshop showed the wide range of applications of the DBM modelling methodology, from data analysis, to simulation, real-time forecasting and emulation. The DBM concepts now have a long history but the talks showed how they are still stimulating some creative developments in different applications. The fundamental idea that underlies the DBM concepts of letting the observations suggest the appropriate form for a model, rather than fitting a pre-defined model to the observations, remains a spur to creativity in modelling the complexity of catchment systems and the meeting was a suitable recognition of Peter Young's contribution in originating and developing the DBM methods. The

presentations from the meeting can be found at **https://www.dropbox.com/sh/1pp9y5nn7t35dyo/75Hi4JiUXg,** including an up-to-date bibliography of DBM articles and manuscript copy of Peter Young's *Water Resources Research* paper. Details of the CAPTAIN toolbox can be found at **http://captaintoolbox.co.uk.** For a collection of papers under the theme of *Data-based Perceptions on Predictions in Ungauged Basins*, Guest Edited by Barry Croke and Neil McIntyre, see *Hydrology Research*, **44**(3), 2013.

Keith Beven, Nick Chappell, Ian Littlewood

AGM
The 31st Annual Gneral Meeting of BHS will be held at Birmingham University, within the 'lunch-break' of the National meeting on 'Wetland Hydrology'. Please try and come to air your views on the future progress of the society.

Knowledge for the future

IAHS-IAPSO-IASPEI Joint Assembly Gothenburg, Sweden 22-26 July 2013

THIS SUMMER THE CITY OF GOTHENBURG, Sweden, hosted games in the Women's Euro Football Championships and a Robbie Williams concert, but the reason I was there in July was to attend the IAHS-IAPSO-IASPEI Joint Assembly. (IAPSO = The International Association for the Physical Sciences of the Oceans; IASPEI = International Association of Seismology and Physics of the Earth's Interior.) The Assembly was attended by 1125 scientists from 85 countries, including 344 IAHS delegates. There was a strong water quality theme running throughout the Assembly, mainly due to the activity of the International Commission of Water Quality, with three workshops and a symposium on water quality which used key note presentations by eminent scientists to draw in participants.

The theme kicked off with the workshop "Anthropogenic radionuclide contamination of water and sediment" in which one session was dedicated to ongoing monitoring of environmental fluxes of Cs^{134} and Cs^{137} in Fukushima Prefecture in Japan, close to the site of the nuclear reactor accident in 2011. Collaborative monitoring sites operated by a number of Japanese universities were established shortly after the accident to examine the transport of radionuclides within different forest and agricultural ecosystems. The results so far have shown differences in fluxes between different tree species, decreasing fluxes over time, and that radioactivity levels in waterbodies so far do not exceed health limits — although it should be noted that these studies are being conducted outside the exclusion zone surrounding the reactor site.

The water quality theme continued with the workshop "Characterising water quantity and quality: new approaches and future directions" which I co-convened with **Wouter Buytaert** (Imperial College London) and **Jim Butler** (Kansas Geological Survey). The keynote presentation at the start of the workshop by **Arthur Horowitz** (US Geological Survey) challenged many of the practices within monitoring dissolved and particulate water quality parameters and gave the audience plenty to think about in their past and future activities. (If readers want to find out more, Art's presentation is based on his review paper in *Environmental Science and Technology* (2013) **47**, 2471–2486)).

Presentations in the workshop reported on a variety of new techniques being applied within hydrology — ranging from tools for rapid assessment of subsurface hydraulic properties to depths of 30 m and trialling biological water quality indicators in Chinese rivers,

to a portable fluorescence device being developed with UK water companies for continuous monitoring of water quality at drinking and wastewater treatment works, and community hydrology monitoring in the Peruvian Andes.

I presented on the role of periphyton (mats containing bacteria, algae and detritus attached to submerged surfaces) in processing and removing iron in mine water-polluted waters. Although we showed that periphyton had a negligible potential for enhancing iron removal within a mine water settling lagoon, we did demonstrate that iron removal by periphyton was predominantly extracellular, occurring within the periphyton matrix rather than intracellular uptake by micro-organisms.

Next up was the symposium "Understanding fresh-water quality problems in a changing world" for which the convenor, **Berit Arheimer** (SMHI – Swedish Meteorological and Hydrological Institute) had done a magnificent job with support from the Swedish Research Council in bringing together delegates from around the world to present regional overviews of the key water quality issues, processes and gaps. The comprehensive overviews drawing on both academic and grey literature are contained within the Symposium *Red Book No.361* published by IAHS Press. The presentations provided an excellent basis for a thoughtful discussion led by **Michel Meybeck** (Sisyphe Université de Paris 6) on how to move forward in water quality from disparate case-studies to holistic analyses which would be more helpful for decision-making. Watch this space!

The final water quality-themed workshop was "How can models help to solve water quality problems?". Highlights of this workshop were: (1) the presentation by **Andrew Wade** (University of Reading) which indicated the potential for incorporating near-continuous measurements of nitrogen and phosphorus species in river water obtained from bankside analysers into improving the process understanding within water quality models; and (2) the demonstration by **Niklas Hjerdt** (SMHI) of the impressive publically accessible online estimates from the S-HYPE model of nitrogen and phosphorus loads (to the nearest kg!) for catchments across Sweden. The estimates include assessments of uncertainty (cunningly displayed in a separate graphic so that user confidence in the estimates is not undermined) and source apportionment and are updated daily (see: **http://vattenweb.smhi.se** – in Swedish).

In the last session of the workshop, participants discussed the conditions for success and also the barriers in the application of water quality models for solving water quality problems. The outcomes will be presented in the next IAHS newsletter and may be extended to form the basis for a collaborative publication.

In between these water quality activities there were also general IAHS activities. The PUB (Prediction in Ungauged Basins) decade 2003–2013 was closed with the launch of the output book, published by Cambridge University Press, which should prove a valuable resource for hydrologists. The next evening the new community hydrological science initiative of IAHS was launched — the Panta Rhei (Ancient Greek for 'everything flows') decade 2013–2023. Calls for research programmes and working groups for Panta Rhei will be made soon.

It is hoped that water quality research will play a prominent role in Panta Rhei which has a focus on change in hydrology and society, both key ingredients of water quality. For more information about Panta Rhei see the position paper in *Hydrological Sciences Journal* (2013) **http://dx.doi.org/10.1080/02626667.2013.809088**.

One community IAHS activity that I helped to convene during the Assembly was the Early Career Hydrologists event. This focused on career opportunities for hydrologists and included presentations by experienced hydrologists pursuing a variety of careers. The event was attended by over 50 early career hydrologists (defined as within 5 years of PhD graduation) who received (along with me), a lot of good advice. It is hoped that such events will become self-sustaining in the future through engagement with the recently formed Young Hydrologic Society **(http://younghs.com).**

Although not so young myself, I am grateful for continued financial support through a BHS Exeter Fund Travel Grant which enabled me to attend and participate in the Joint Assembly.

Kate Heal
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Hydrology at Lancaster University

LANCASTER IS ONE OF THE UNIVERSITIES THAT in 2014 will celebrate 50 years since its foundation. Hydrology was part of the University teaching from early on with the formation of the Environmental Sciences Department with Gordon Manley as the first Head of Department. The first Environmental Science students graduated in 1969, and some of these early students went on to have long careers in hydrology at the Institute of Hydrology, Environment Agency and its predecessors and the water Industry.

Lancaster also made the first appointment of a Professor of Hydrology in the UK in 1975 when Terrence O'Donnell moved from Imperial College as a joint appointment between Environmental Science and Engineering. A systems approach to the Environmental Sciences was also developed with the appointment of Peter Young as Head of Department in 1981.

Hydrology is now part of the Lancaster Environment Centre (LEC) which is one of the largest departments in terms of both student numbers and research income on the University campus. It is, in fact, one of the largest environmental research centres in Europe, with some 300 academic, research and support staff. Within LEC the Water Sciences group includes 10 professors (Young, Barker, Beven, Binley, Davison, Heathwaite, Haygarth, Quinton, Walker, Zhang), 10 other academic staff, 10 post-docs and 32 PhD students at the current time (see below).

Andy Binley received the Frank Frischknecht Award presented by the Society of Exploration Geophysicists (SEG) and the Environmental and Engineering Geo-physical Society (EEGS) for his long-term contributions to the field of near-surface geophysics, and in particular hydrogeophysics in 2012, and in 2013 has been made a Fellow of the American Geophysical Union. In 2012 Keith Beven received the Robert Horton Medal of the American Geophysical Union. Louise Heathwaite is currently seconded part-time to the Scottish Government as Chief Scientific Adviser for Rural and Environment. Previously, Louise worked as science champion for the Natural Environment Research Council (NERC) as Theme Leader for the Sustainable Use of Natural Resources theme from 2008–2012.

LEC offers water and soil related MSc courses in Sustainable Water Management; Sustainable Agriculture and Food Security; Environmental Science and Technology; Resource and Environmental Management, Contamination, Risk Assessment and Remediation; and Environmental Biotechnology and Toxicology. There are also good research links on water related projects with other groups in LEC, in particular Soil Sciences and Plant and Crop Sciences, and also within the University campus: Statistics (Jon Tawn) and InfoLab (Gordon Blair), Engineering (George Aggidis, James Taylor), and CEH (Stephen Maberly, Alex Elliot, Ian Jones, Paul Scholefield and others).

The aim of the Water Sciences grouping is to undertake pure, strategic and applied research to develop scientific tools and techniques to solve problems related to land and water management. The target is to provide a truly interdisciplinary approach, incorporating physical hydrology, aquatic chemistry, soil science, biogeochemistry and social

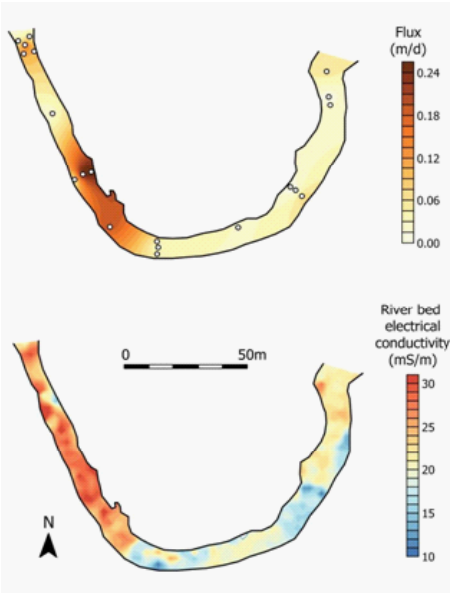


Some of the Lancaster Water Sciences group on an away-day to help with coastal transport research on the Fylde Coast.



Transporting water quality sampling equipment to site in the Morland sub-catchment of the River Eden. The riparian area adjacent to these grassland fields has recently been planted with saplings to establish new habitat within the sub-catchment and to act as a buffer zone between agricultural land and the adjacent stream network.

of mitigation measures. Some of the projects have also employed sophisticated spatial mapping methods, using for example geophysics and fibre optic distributed temperature sensing, to help characterize the hydrological system. An example result from the River Leith project is shown below.



Groundwater-river interactions on the River Leith. The upper plot shows Darcy-based estimates of vertical water fluxes from the subsurface (derived from in-stream piezometers); the lower plot shows spatial patterns in bulk electrical conductivity of the river bed sediments from water-borne geophysical surveys. Combined, these data revealed a localized source of groundwater emerging into the river, with limited hyporheic exchange.

sciences, delivered through shared catchment platforms, modelling and uncertainty analysis. The group works with the world-wide water industry, policy makers and others to deliver innovative solutions for a sustainable water management. It has also contributed a number of useful textbooks including the 4th Edition of Shaw's *Hydrology in Practice* (2010) and Keith Beven's *Rainfall-Runoff Modelling* (2nd Edition in 2012) and *Environmental Modelling – An Uncertain Future*? (2009), as well as other edited volumes.

A common theme running through a lot of LEC research is the link between soil and land-use, runoff generation and stream/groundwater interactions, diffuse pollution and water quality in rivers and lakes. This includes work at various locations in the River Eden catchment, as part of the Defra Demonstration Test Catchments (Haygarth, Surridge, **www.edendtc.org.uk**, Phosphorus Export and Delivery from Agricultural Land (Heathwaite, Haygarth, Beven, http://www.lec.lancs.ac.uk/news_and_events/news/?article_id=1017) and Mitigation Options for Phosphorus and Sediments (Quinton, **mops2.diffusepollution.info**) projects.

Work funded by NERC on stream/groundwater interactions in the River Leith tributary of the Eden (Binley, Heathwaite) is looking at the fine temporal and spatial structure of hyporheic exchanges and in-stream nutrient dynamics. Experimental approaches developed from this work are now being applied by Binley to one of the NERC Macronutrients initiative projects in the Hampshire Avon.

Many of these projects have involved continuous streambank sampling of nutrient concentrations, as well as more traditional storm and grab sampling methods, and much more is being learned about the limitations of nutrient load estimates and how to evaluate different types

Other related expertise includes the hydraulic interactions of flows with vegetation (Folkard), coastal hydraulics and sediment movements (Ilic) and the study of isotopes in water, ice, diatoms, sediments and nutrients (Barker, Pates, Surridge, Wynn).

In related work, Ben Surridge and Phil Haygarth have recently been awarded funding from Defra to research nutrient cycling and nutrient management in Chinese and UK agriculture. The research at Lancaster will develop a new framework to quantify the stocks and fluxes of nutrients within key agricultural systems in both China and the UK. As one of the world's largest producers and consumers of finite inorganic phosphorus fertiliser, the management of nutrients in China has potential implications for agricultural production globally. The project is part of the Sustainable Agriculture Innovation Network, a collaboration between the UK and China to develop and exchange innovative approaches related to nutrient use in agriculture.

LEC is a core partner on a NERC project that addresses 'Diversity in Upland Rivers for Ecosystem Service Sustainability (DURESS)' (Chappell). We are responsible for monitoring and modelling the hydrological and hydro-chemical controls on aquatic biodiversity. The work involves the instrumentation of four upland micro-basins near Llyn Brianne and time-series modelling of these and wider DURESS data-sets from across upland Wales. We work with many partners in Wales, but our key collaborations are with CEH (through joint DURESS work within the Plynlimon Experimental Catchments), Cardiff University, Dŵr Cymru Welsh Water and Forest Research.

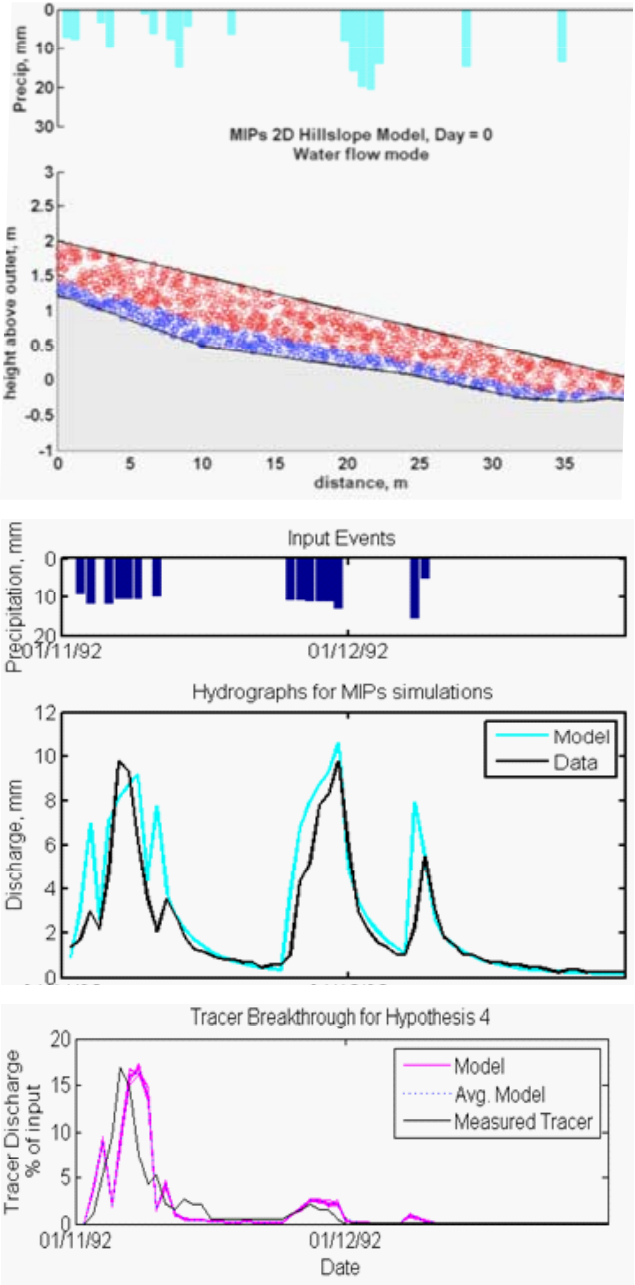
LEC, through Nick Chappell, also have a 20-year partnership with the Sabah Foundation who maintain the world's leading research station within equatorial rainforests. Within the pristine and human-modified forests at this location in Malaysian Borneo, we conduct long-term research into tropical hydrological processes and water resources subject to forestry- and climate-related disturbances. Technology transfer is a key component of this research, involving postgraduate training of scientists from Malaysia, UK and elsewhere. Local and international funding continues to support the development of the research capabilities of this unique facility.

LEC research in floods and flooding ranges from the development of local flood forecasting systems (Young, Beven), research into the statistics of joint probabilities (Tawn), estimating uncertainty associated with flood runoff generation and inundation models (Beven) and social science research into the impacts of flooding. The Hull Floods Project has influenced government policy on recovery and resilience following disasters. The Project Team, led by Will Medd, recently received one of the Economic and Social Research Council's (ESRC) first 'Celebrating Impact' prizes for Outstanding Impact in Public Policy.

LEC is also trying to span the interdisciplinary range from science to social science to applications through other means as well, particularly in the development of the NERC funded Catchment Change Network and more recently through the Catchment Change Management Hub (**ccmhub.net.uk**) funded by the NERC Water Security KEP, ScienceWise and the JBA Trust with collaboration from Cascade Consulting, the Rivers Trust and Defra and others.

The CCM Hub is maintained by Marion Walker and is a place where people who are interested in the well-being of their local rivers and wider water environment can share understanding and make links across river catchments. In particular, it has become one means for the distribution of information for Defra's Catchment Based Approach to water management for the Water Framework and Floods Directives, announced by Richard Benyon, (Minister for the Natural Environment and Fisheries), on Water Day 2011.

Lancaster has long been known, of course, for its expertise in hydrological modelling and uncertainty estimation particularly through the research of Peter Young, Keith Beven and Andy Binley. The Data-Based Mechanistic (DBM) modelling methodology pioneered by Peter has been used in a wide range of applications from modelling water quality to flood forecasting and was recently the subject of a BHS National Meeting held at Lancaster (presentations and a bibliography of DBM papers can be found at **www.dropbox.com/sh/1pp9y5nn7t35dyo/75Hi4JiUXg**; see also page 17, while the CAPTAIN toolbox for Matlab, with contributions from Wlodek Tych and James Taylor, can



Representation of flow and transport in a tracer experiment in the Gårdsjön catchment, Sweden (vertical moving particles in red, lateral particles in blue) with resulting observed and predicted hydrograph and tracer concentrations.

be found at **captaintoolbox.co.uk**).

Topmodel and Dynamic Topmodel continue to be used widely, and the Generalised Likelihood Uncertainty Estimation (GLUE) methodology paper, first published by Keith Beven and Andy Binley, continues to be highly cited and the cause of continuing debate in the literature even after 20 years. Keith Beven has also been working on a new modelling methodology that has been reported in papers with Jess Davies called the Multiple Interacting Pathways (MIPs) model. This treats water in the system as discrete particles, differentiated by their local velocities so that preferential flows are represented quite simply. The first small scale applications of the model have been very positive (Figure 4).

Novel approaches to measuring hydrological and hydrochemical properties and processes is a core element of Water Sciences research at Lancaster. There are strong links with the environmental chemists in LEC, particularly in the application of the DGT (diffusive gradient in thin films) technology for passive sampling of concentrations at mm scale resolutions or over longer periods of time that was invented at Lancaster by Bill Davison and Hao Zhang (see **http://www.dgtresearch.com**). Andy Binley has been developing geophysical approaches to hydrological characterization for over 20 years at Lancaster. This research has led to new algorithms for data inversion, new measurement techniques and new insights into the relationships between geophysical and hydrological properties.

Water management and governance under the uncertainties of future change are a shared concern across the group (particularly Nigel Walker). LEC has a very active Enterprise and Business Partnership group led by Ruth Walker and is a paying member of British Water (Cranfield being the only other academic institute in the group), which represents the

industry collectively to government, regulators, other institutions, customers and the media. A recent initiative together with Liverpool University is the Centre for Global Eco-Innovation (CGE). This has resulted in over 20 new PhD studentships linked to industry, a number of which are in the Water Sciences group.

There is a lot going on at Lancaster related to hydrology and its related fields. Given the wide range of activities of the LEC Water Sciences research it is difficult to do it justice in a brief article, but more detail may be found at the recently updated LEC web pages at **www.lancs.ac.uk\water.**

Obituary

Elizabeth M Shaw

Born 14th February 1928
Died 25th April 2013



ELIZABETH SHAW WAS A HYDROLOGIST WHO was best known throughout the world for her textbook *Hydrology in Practice*. Her life story was equally interesting. Her passing marks the end of an era in British hydrology.

Elizabeth was born at Hebburn on Tyne in 1928 and, following the arrival of a younger brother, Norman, when she was about six or seven, she was looked after by her Grandmother Anderson and a maiden Aunt Lottie who lived in Durham. When the war came along, Elizabeth continued to live with them at a safe distance from the bombing of Tyneside. She completed all her primary and secondary school education in Durham and then went on to University at Bedford College in London, graduating with degree in Geography in 1949. The course included a field course in the Wicklow Mountains and a visit to Trinity College Dublin. The trip had the added bonus of being free from post-war rationing – unlimited bacon and eggs and access to nylon stockings!

She then did a teaching Diploma and taught for a while at Ormskirk Grammar School. But she had the bug for hydrology and she went to Durham University in 1953 to take a postgraduate course in hydrology. This involved her living, on her own, in a little cottage in Upper Weardale for two years whilst she measured rainfall and run-off over the whole catchment. This entailed her travelling around the area on a 125cc Royal Enfield motor bike!

In 1955 she was invited by Professor Gordon Manley (who was later to establish Environmental Studies at Lancaster) to work as a Research Assistant at Bedford College where she had done her first degree. In this capacity she was given the task of calculating the 10-year running means of the Central England temperature record from 1680 to 1957. This comprised 17 series, the 12 monthly mean temperatures, 4 seasonal temperatures and the annual means. She did this in just three weeks using the department's 'new' Facit Hand Calculating Machine. The Central England temperature series continues to be updated each month by the UK Meteorological Office.

In 1959 Elizabeth was responsible for the organisation of a major project on the microclimates and ecological studies of the karstic fissures on The Burren, Co. Clare. The ecology elements were organised from Trinity College Dublin.

In 1960, she was invited by Professor Stanley Beaver to undertake research work at the University College of North Staffordshire (which became Keele University in 1962). In his letter to Elizabeth, Prof Beaver wrote "Briefly, the work is to study why it rains in this area, and why different sorts of rain have different incidence over the Cheshire Plain and the Pennines." And so she

did, completing the work and publishing a paper on the subject.

In 1963 Elizabeth was appointed as hydrologist to the Devon River Board at Exeter, and it was at this time that she started to become known internationally. She gave a paper to a WMO International Conference in Quebec, Canada. This in itself was a landmark achievement, which attracted the attention of the *West Country Express and Echo* with a piece headlined "Hydrology is this expert's business". She was a woman in what was generally a 'man's world'. The only other woman at the conference was a Russian. More was to come. In 1965 she was recruited by Professor Peter Wolf to the Civil Engineering Department at Imperial College. She had now broken another two barriers: a woman in an engineer's world and a geographer in an engineer's world.

Her academic work was nearly always focused on meteorology and rainfall, particularly Areal Rainfall Estimation and Network Design. Applications ranged from the benchmark Lynmouth flood with Dr Prus-Chacinski of Dobbie and Partners to a long-term study of rainfall in New Guinea in which she was introduced to multiquadric splines by Paul Johnston. This in turn led to a publication of a paper with Peter Lynn, one of the Imperial MSc students. She also did work on network design with another MSc Student, Peter Herbst from South Africa. Together with Imperial colleague Enda O'Connell she published a paper using spatial correlation analysis to assist in designing rain gauge networks. Elizabeth's connections to Irish hydrologists extended to Eamon Nash and Jim Dooge who were regular visitors to Imperial in the 1970s, as were many other hydrologists with international reputations such as Raudkivi, Gumbel, Linsley, Amorocho, Matalas and Midgley. She knew them all and inhabited their world.

Hydrology in Practice, published in 1983, was her big professional achievement, and must go down as a milestone in British Hydrology. It fulfilled a personal goal of training engineers to be competent in hydrology, and she had the energy, enthusiasm and dedication to deliver what was needed.

After her retirement from Imperial College, Elizabeth moved to Hornby in the Lune Valley, where she continued to work on improvements to *Hydrology in Practice*, with 2nd and 3rd editions being published in 1988 and 1994. These continued to be popular undergraduate and postgraduate texts but got overtaken by new developments, particularly when the Flood Studies Report was replaced by the Flood Estimation Handbook in 1999. The book continued to sell, however, and Elizabeth badgered the publishers to see it updated. Eventually, Taylor and Francis approached Keith Beven at Lancaster University who agreed to undertake the task with the help of Nick Chappell, also at Lancaster, and Rob Lamb of JBA Consulting and other staff at JBA. Since Lancaster was only just downstream of Hornby, it was possible to discuss the 4th edition with her.

While clearly proud of what *Hydrology in Practice* had achieved, she felt that because the 4th edition was much changed from the first three editions, it was not right that she should continue to be one of its authors. However, just before the manuscript was submitted Keith Beven pointed out to Elizabeth that a lot of material had been carried over from the earlier editions and that in any case everyone had known *Hydrology in Practice* simply as 'Shaw' ever since it was first published. So Elizabeth remains as first author and it can still be known as 'Shaw'. The published version was delivered to her in Hornby before the Alzheimer's took too great a hold, and is a fitting tribute to her contribution to hydrological education in the UK and many other countries.

Her pastoral care of students on the Engineering Hydrology MSc course at Imperial is well known. She supported the underdog — persuading colleagues to accept onto the course a number of students with third class degrees, sensing an aptitude for the subject not measured by their previous academic performance alone. Just as she herself had had to grapple with the mathematical side of the subject despite not having an engineer's background in maths, she had an empathy for those she saw as struggling in the academic world.

Her caring attitude extended to her colleagues. Enda O'Connell recalls joining the hydrology group at Imperial 1968 as a 'young greenhorn' lecturer who had come to London from University College Galway. Elizabeth took him under her wing and gave him wise words of advice and encouragement. He also recalls her warmth and friendliness, her infectious enthusiasm about her work, and her

remarkable energy. He also says she had an incisive scientific mind, and was always critical of academic work that was not up to her standard. Paul Johnston, another Imperial colleague, recalls that at her retirement gathering in 1984, Professor Ian Munro, who was Head of Department at the time, noted that Elizabeth was the only person he knew who still watched the BBC snooker on TV in black and white – and could clearly follow all the shots! Perhaps this reflected her hydrological training and the importance of careful observation of data....

Paul Jowitt remembers that when he and Howard Wheater were recruited to fill the boots of Mike Hall and Enda O'Connell (not an easy task!) it was to Elizabeth that they turned when the Imperial Engineering Hydrology MSc was re-launched. Elizabeth provided the continuity, and the course's foundation teaching in the basics of hydrology and meteorology.

Elizabeth had strong views. Even after she had retired, she would opine at length about the loss of local engineering expertise in managing catchments with the formation of the regional Water Authorities and later the Environment Agency. Her local MP for Hornby also received numerous missives on the subject.....

She was a kenspeckle character. She had a lovely chuckle which many will still be able to hear. And she bought the Jowitt children Mr Men and Little Miss books.... In retrospect, she could have been the lead character in one of them all by herself — Miss Hydrologist.

Paul Jowitt, Keith Beven
with contributions from the Rev Norman Shaw,
Paul Johnston, Enda O'Connell

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UK Hydrological Bulletin: May – July 2013

After the hydrological pyrotechnics of last year, runoff patterns were more subdued through the first half of 2013, but temperatures were seasonally very unusual: an exceptionally hot July followed a notably cool spring. River flows and aquifer replenishment were generally within the normal range through the spring and early summer and overall water resources remained healthy. However, the persistence of high pressure during most of July — with an associated prolonged heatwave — changed the complexion of the landscape and the arid conditions triggered sustained river flow recessions.

By mid-July heat stress had become a significant health issue, the parched soils were impacting on agriculture and fire risk in the countryside had increased markedly; there was also significant ecological stress as headwater streams dried up. Although, overall reservoir stocks, and groundwater resources, remained well within the normal summer range, heatwave-related surges in water demand stretched water treatment and distribution capacities. Late July witnessed a further transformation: heavy rainfall and intense

thunderstorms terminated lengthy sequences of rainless days in most areas, disruptive flash flood events were very common and, approaching month-end, flood alerts were widespread across northern Britain.

May was a very unsettled month with a distinctly autumnal feel. It was the coldest May since 1996 and successive incursions of polar airmasses contributed to substantial snow accumulations on high ground. The third week was especially unsettled; a sequence of deep Atlantic depressions brought heavy rainfall and gale force winds which impacted most severely in western areas. On the 13/14th, parts of Carmarthonshire recorded rainfall totals in excess of 70 mm. Moderate snow accumulations then contributed to, mostly modest, floodplain inundations during the third week — but the Tywi and Eden were among a number of rivers where peak flows exceeded the previous May maximum; in Northern Ireland, the River Faughan also established a new highest flow for the month in a series from 1976.

The very cool May contributed to the coldest spring since 1962 for the UK and in the Central England Temperature series, average temperatures over the March-May period have not been appreciably lower since 1891. Correspondingly, many crops were slow to become established and transpiration losses were moderate. Nonetheless, the development of soil moisture deficits was far more typical of average conditions than in either 2011 or 2012 (see Figure 1). Correspondingly, river flows followed typical seasonal recessions albeit with runoff rates below average in most regions. However, many groundwater-fed streams were still flowing healthily — a legacy of the record aquifer recharge in 2012. For the Coln, which drains part of the Cotwolds, flows had remained above the daily average for over a year (Figure 2), the longest such sequence in a 50-year series. For the spring as a whole, outflows from Britain were appreciably below average for the fifth successive year; a tendency to decline may be recognised from the late 1970s (see Figure 3).

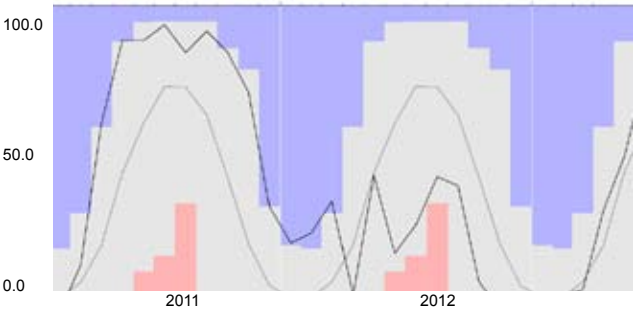


Fig 1 *End- of- month soil moisture deficits for the English Lowlands (the blue and pink envelopes represent the pre-2011 monthly max. and min.; the grey trace is the long term average). Data source: MORECS*

June was another relatively cold month with rainfall totals generally below average; England registered its driest June since 2006 with some, mostly eastern, areas recording monthly rainfall totals of less than 15 mm. For the UK as a whole, only May registered above average rainfall over the first six months of 2013 and, by the end of June, moderate rainfall deficiencies had developed across much of the country. The most notable shortfalls were in the west; north-west England recorded its third lowest January–June rainfall in the last 40 years. Despite the limited rainfall, reservoir stocks and groundwater resources generally remained well within the normal seasonal range.

Early in July the Jet Steam adopted a more northerly track, allowing the Azores high pressure cell to extend across almost all of the UK — heralding an exceptionally warm and dry episode which lasted through most of the month. Many areas reported 20, or more, successive days without a trace of rainfall (but there were some observations of virga – precipitation that evaporates before reaching the ground). Heatwave conditions extended across much of the country; temperatures even nudging 30°C at Aviemore, and daily maxima exceeded 28°C for lengthy periods.

As soil moisture deficits climbed steeply, the countryside — verdant in the early summer — took on a very parched complexion. The arid conditions triggered a spate of woodland and heathland fires and substantial increases in both spray irrigation and domestic demand — reportedly rising by 30% in some localities. Seasonal river flow recessions steepened with a corresponding contraction in the stream network; in the fourth week,

the Environment Agency rescued fish isolated in headwater reaches of the River Teme (Herefordshire) as both water levels and oxygen content, declined.

A southward excursion of the Jet Stream late in July brought an abrupt termination to the rainless episode in most, but not all, areas. With synoptic patters dominated by low pressure, very humid air was drawn across the UK from the south, resulting in frequent, and locally violent, thunderstorms. On the 22/23rd Nottingham recorded a rainfall total of 67.8 mm in 24 hrs – nearby Market Bosworth (Leics) registered 21 mm in less than an hour — and on the 26/27th many localities (including Manchester and Durham) reported 24-hr totals of 30–50 mm. Much of the rainfall was convective and its intensity overwhelmed local drainage capacities; urban flash flooding was common and transport disruption considerable — the rail service between Edinburgh and Berwick were interrupted on the 23rd. Seasonally notable spates were also common in rivers draining impermeable catchments, particularly across Scotland and northern England. Weather patterns remained unsettled with further, mostly urban, flooding in southern Britain but Flood Alerts were widespread across Scotland during the final week of July.

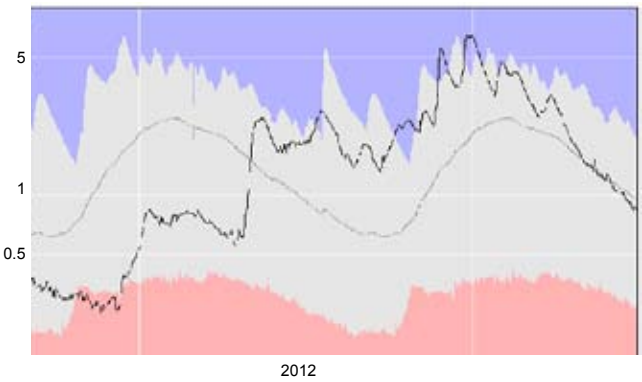


Fig 2 *Daily mean flows for the River Coln at Bibury (the blue and pink envelopes represent the pre-2011 monthly max. and min.; the grey trace is the long term average).*

Terry Marsh
Centre for Ecology & Hydrology
tm@ceh.ac.uk
30/7/13

For more details of the National Hydrological Monitoring Programme please visit:
www.ceh.ac.uk/data/nrfa.nhmp

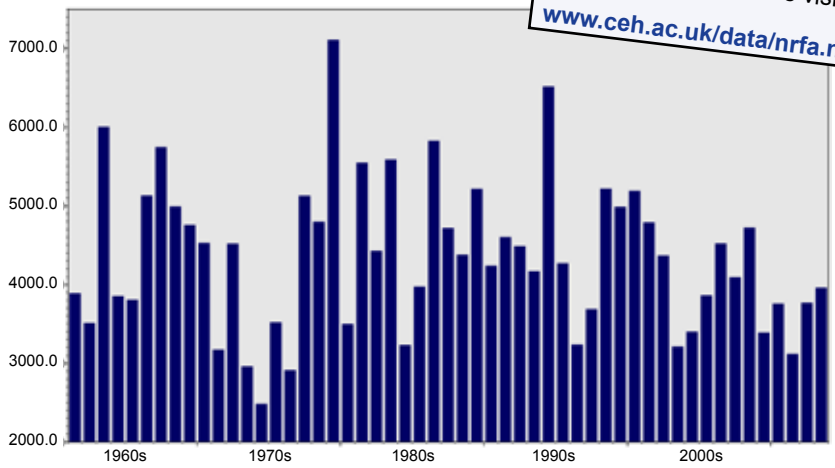


Fig 3 *Spring (March-May) outflows from Great Britain 1961–2013*

Letter to the Editor

Dear Celia

I have just taken on two more small scale flood risk assessments for clients. My dealings with the EA on these have on, the whole, been less than satisfactory, which have led me to some thoughts on the role of the Agency and the wider prospect of hydrology for the future.

First and foremost, I find the near impossibility in being able to contact a professional officer, Hydrologist or Planning Liaison, is most irksome. Whether one speaks to the National "Helpline", or someone at an Area, one meets with the sort of organisational barrier used by insurance companies, banks, and of course any government department or quango you can think of. I see that the Area offices, that once upon a time had a receptionist/telephonist, who had the wit and understanding to direct one's enquiry intelligently, have now been replaced by Customer Engagements personnel. This function was previously known as "External Relations". Why the change, I wonder? Presumably vast sums have been spent on PR consultants and internal meetings to decide this revolutionary change. The end result is still the same: a standardised email response quoting the "Standard of Service" in dealing with any query: 10 days for a response; 20 days for delivery of data. Sometimes a request requires some initial information, such as location of hydrometric stations, lengths of record, coverage of models, etc., to ensure that one is confident of obtaining the best and most appropriate information for one's client.

I usually try to get round this obfuscation by contacting someone at the Area with whom I have dealt with previously but internal staff movements may make that diffcult. Both of my jobs now under way are with Areas I have dealt with within the last 12 months. On several occasions, I have received the response that the individual is no longer working there. Some may have left or been transferred — not much help in developing what I feel is the necessary both for the professional experience of the individual and his/her knowledge of the Area in which they are working. It must also be very unsatisfactory for staff members to have no job security and be pushed from pillar to post. This of course is nothing new: I am sure we can all quote a string of reorganisations and refocussing that have bedevilled the EA since its inception.

The final point is that the shared functions between Areas can mean that one's particular line of enquiry is handled by 'Customer Engagements' who are different from the Area for which you are

contd....

hoping to obtain information. I have even found that enquiries have been diverted to another Area because no-one is on duty that day. "We will take a message and pass it on tomorrow", was one reply. Which may or may not be any better or worse than being invited to contact the National "Helpline "- - -!

All too often the response from the officer concerned consists of a standard format computer generated letter in which items assumed to be relevant or otherwise have been given the cut and paste treatment to achieve a "performance target". Demoralising and frustrating for both the employee concerned, who is having to follow "guidelines" and the enquirer. I have fears that the Agency is moving from a technical organisation to a purely bureaucratic function. This must surely further reduce that attraction of such a career choice for a young hydrologist.

Yours pessimistically

James Dent

Editor's comment:

The problem 'professional hydrologists' — as opposed to the general public —have with contacting with the Agency has been discussed before within the BHS Main committee. With permission, therefore, I passed this letter on to our EA representative on the Committee, inviting a reply. Nothing has been forthcoming directly.

However, James has since spoken with the EA's Hydrology team leader. The perennial issues of staffing, part-time and temporary assignments and gaps when someone is on leave or when there are particular situation which ties people up, e.g. floods and droughts, are all problems. It seems that proper hydrologists are, as usual, thin on the ground, and unlikely to improve with the funding limitations and recruitment embargo.

A full review of the staffing issues; including training, recruitment, retention, career development, etc. is planned for the next year as there is concern that the present situation is not good for developing a depth of expertise within the organisation.

Perhaps this matter is something BHS could offer to assist with?

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.

. To apply, use the form at *www.hydrology.org.uk/about_awards.htm* or contact Nigel Goody, SEPA, 7, Whitefriars Crescent, Perth PH2 0OPA *(tel 01738 448806, email: nigel.goody@sepa.org.uk).*

Diary

5-7th September 2013
Experiences in Asia and Europe
International conference, Exeter.
Further details – http://www.icfr2013.org/

11 September 2013
Embracing Hydrological Uncertainty
Scottish Hydrological Group Technical Meeting
Location: Royal Overseas League, 100 Princess Street, Edinburgh
6.30–8pm

11th September 2012
Wetland hydrology
BHS National Meeting
Location: University of Birmingham, B15 2TT
Contact: David Hannah (Tel: 0121 414 6925)

also:

BHS Annual Gneral Meeting
The 31st AGM will be held from 12–1pm during the National Meeting, at University of Brimingham (see above). AGM Agenda on separate flyer: also note important items on page 9.

10th October 2013
Student presentations
Scottish Hydrological Group Technical meeting

22nd October 2013
Hydrometric data: the long view
A celebration of 30 years of the NRFA and NGLA.
BHS National meeting
Location: CEH Wallingford.
Register by 20 Sept. (see separate flyer for details).

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- Web pages: **http://www.hydrology.org.uk/**

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

24th Octobter 2013
Lessons learned from 2011–12 freaky weather
South-East Section meeting
Location: ICE, london.

21st November 2913
Hydrology for flooed risk management
ICE

18th December 2013
Hydroecology & water abstraction: science, practice and licence reform
University of Birmingham

Full details of BHS meetings are on the 'Events' page at **www.hydrology.org.uk**

Editor - Hydrology Research

Hydrology Research is the official journal of the BHS and published by IWA Publishing. Both BHS and the Nordic Association for Hydrology appoint Editors who manage the publication process and liaise with the publishers on production and policy of the Journal.

BHS is now looking for an Editor to take over the role from Ian Littlewood, who has successfully helped the Journal grow to a significant publication. The Editor is appointed for a 4 year period. Further information on the role is available on the Society's website www.hydrology.org.uk

Copy deadline for* Circulation *No. 119
23th October 2013