

CGU HYDROLOGY SECTION COMMITTEE REPORTS 2011

Northern Research Basins Committee

Chair and Canadian Chief Delegate:
**Christopher Spence, Environment
Canada, Saskatoon, SK.**

The main activities of the CGU-HS Northern Basins Committee during the last year was preparing for the 18th Northern Research Basins Symposium and Workshop in Western Norway, August 15 – 20, 2011. This meeting will begin in Bergen and involve travel via ship and bus to Loen, Kjenndal, Fjorland, Sognefiord and Voss. The conference theme is **Methods For Measuring, Collecting and Assimilating Hydrological Information in Cold Climates**. Two Canadians have been invited to deliver keynote addresses; Dr. Daqing Yang on snow, and Dr. Terry Prowse on research basins. Full details of the meeting can be found at www.18thnrb.com.

As outlined in the NRB Mandate and the Canadian NRB Terms of Reference, Canadian participation in the NRB meeting is limited to 10 delegates invited by the Canadian Chief Delegate (and approved by the CGU-HS Executive). The expertise of the delegates is meant to best encompass the breadth of the northern Canadian hydrology field and of the particular conference theme. The Canadian Chief Delegate to the 18th NRB meeting will be Christopher Spence of Environment Canada, while Scott Lamoureux, of Queen's University will serve as the Deputy Chief Delegate. The remaining slate of official Canadian delegates was submitted to the CGU-HS for approval in Jan. '11. These include:

Chris Derksen, Environment Canada: Snow
Richard Janowicz, Yukon Territorial

Gov't: Water Management
Sarah Boon, University of Lethbridge:
forest hydrology
Craig Smith, Environment Canada;
Precipitation
Dr. Terry Prowse, Environment Canada
University of Victoria: Ice
Daging Yang, Environment Canada:
Regional Hydrology
Ming-ko Woo, McMaster University:
Permafrost Hydrology

Canada continues to be responsible for the main NRB websites and NRB listserv; maintained through a contract with Laura Brown of the University of Waterloo. These web sites: www.canadiannrb.com and www.northernresearchbasins.com contain information about the working group, the Canadian committee, past meetings, links to relevant websites, numerous photos, and the 18th NRB. Contact Chris Spence at chris.spence@ec.gc.ca for more information.

Canadian National Committee for the IAHS Prediction in Ungauged Basins Initiative (CNC-PUB)

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The objective of CNC-PUB <http://www.iahs-pub.org/WG15.php> is to coordinate and communicate IAHS's PUB <http://www.iahs-pub.org/index.php> program in Canada.

The roles of the CNC-PUB are defined as follows:

- Liaising with water resource managers and government agencies in the development of programs supportive of the PUB initiative,
- Supporting PUB working group implementation and funding in Canada,
- Supporting outreach of working group scientific progress,
- Encouraging technology transfer from working groups,
- Reporting to CGU-HS and CSHS on Canadian PUB activities and
- Reporting to IAHS on Canadian PUB activities through CNC-IAHS and the PUB SSG.

Progress on Issues and Objectives

The Improved Processes, Parameterization and Prediction in Cold Regions (IP3) initiative will complete its final year of funding in 2011 by the Canadian Foundation for Climate and Atmospheric Sciences. IP3 is registered as a cold regions working group with the international PUB initiative (<http://www.iahs-pub.org/WG16.php>). More information on IP3 specifically can be found at www.usask.ca/ip3.

This report will be tabled after the **Putting PUB into Practice** workshop has been held from May 10 – 14, 2011. It is being

arranged by a Local Organising Committee chaired by Paul Whitfield recently of Environment Canada, in conjunction with a Scientific Programming Committee led by Dr. John Pomeroy (PUB 4th Biennium Chair) and formed from leading members of the PUB movement from around the world. The principal aim of the meeting will be to make progress towards a crystallisation of 'state of the art' PUB research, in order to facilitate its encapsulation in tools which contribute directly to the solution of real-world challenges in water resources management. The meeting is bringing together a broad cross-section of researchers, practitioners and toolset developers with interests in this field. By examining a gradient from data-rich to data-poor contexts, and considering the needs of a range of hydroclimatic regions, the workshop will seek to share and consolidate knowledge between and across PUB Themes and Working Groups, and the variety of regional efforts and perspectives represented in the movement. As the PUB decade winds down, it is crucial for the Canadian and international PUB movement to focus on information and technology transfer at meetings such as these.

CNC-PUB continued the delivery of thematic workshops with **Zeroflow: A PUB Workshop on Intermittent Streams** held February 23 - 25, 2011 at the Dinosaur Trail Golf and Country Club, Drumheller, Alberta. The organizing committee included Sarah Boon, University of Lethbridge; Emily Huxter, Environment Canada; Daniel Peters, Environment Canada ; Christopher Spence, Environment Canada ; Ilja Tromp-van Meerveld, Simon Fraser University; Paul Whitfield, Environment Canada. In more arid regions of Canada, streams contain water only during restricted periods of the year. Improving the measurement, prediction and management of water flux

and availability in intermittent systems is important to economic and environmental sustainability in certain areas of Canada. This workshop brought together scientists and managers who are engaged in understanding and managing these systems. We hosted seven invited speakers, four poster presentations, and an additional thirty attendees from various sectors of academia, government and industry. Participants came from across the country, highlighting the importance of intermittent streams to many regions of Canada. The workshop was structured around a series of presentations and discussions that centred on three key themes; measurement, analysis, and applications. The invited speakers have provided their presentations in PDF format, which are posted on the workshop's website, <http://www.sfu.ca/~zeroflow/>. We are also working on a special issue of the Canadian Water Resources Journal, which will contain papers from this workshop. As a follow-up to the workshop, we invited participant input on two key points that arose from our discussions:

1: Data Visualization: What do you see as useful tools for visualizing data from or about temporary streams? What tools do you currently use and why?

2: Temporary Stream Classification: We agreed that temporary stream systems require some type of classification technique or unique 'barcode'. What parameters might we include in this classification system, and how might we ensure that it remains dynamic?

We welcome additional input from the PUB community on these topics, and hope to host a second workshop to build on the progress from this one.

Future Meetings and Activities

The PUB decade ends in 2012, and as noted above information and technology transfer activities will be the focus of CNC-PUB. The jointly held annual conferences of the Canadian Geophysical Union and the Canadian Water Resources Association in 2012 and 2013 provide excellent opportunities for special PUB sessions to highlight the progress made in improving prediction in ungauged basins in Canada. Canada is proposing a Kovacs Colloquium on PUB to be held in Paris in 2012 as a PUB wrap-up activity.

Committee on Isotopic Tracers

Committee Members:

Jean Birks (Chair), Alberta Innovates-Technology Futures, University of Waterloo
Tom Edwards, University of Waterloo
John Gibson, Alberta Innovates-Technology Futures, University of Victoria (Past President IAHS International Commission on Tracers)
Claude Hillaire-Marcel, GEOTOP-UQAM
Bernhard Mayer, University of Calgary
Fred Michel, Carleton University
Tricia Stadnyk, University of Manitoba
Brent Wolfe, Wilfrid Laurier University

Background

The CGU - HS Committee on Isotopic Tracers was established in 1997 to support and facilitate information exchange between isotope specialists and hydrologists both within Canada and internationally, and to address issues of importance to isotopic investigations including integration within broadly-based hydroscience research programs. Recognizing and supporting promising applications of isotopic tracers, promoting cooperative research, providing information resources, and articulating research and educational needs to

government agencies, universities, and the general hydrology community are the fundamental aims of the Committee.

Objectives and Activities

The long-term objectives of the committee are to:

- promote and advance the understanding and application of isotopic tracer techniques in hydrology and related sciences
- initiate and participate in research and education programs, maintain contact with relevant organizations, report on national and international research activities, information sources, isotope monitoring networks, and databases
- establish working groups and/or subcommittees to assess specific, high-priority topics for research, monitoring and/or development, and
- disseminate current research and important findings to the scientific community via discussion, meetings and conferences, and publications

Progress on Issues and Objectives:

Tracer committee members continue to be active in the promotion and advancement of the understanding and application of isotopic tracer techniques in hydrology and related sciences. Of particular interest are the application of isotope tracers for the evaluation of hydrological and hydroclimatic models and the organization of regional, national and global networks that serve to build scientific capacity for tracer-based research. Recent advances in water isotope lasers have made analyses of $\delta^{18}\text{O}$ and $\delta^2\text{H}$ of water and water vapour more accessible to the hydrological community giving new importance to our objective of promoting and advancing isotope tracer techniques. The proliferation of new water isotope datasets offers new opportunities to use the labeling of the stable

isotopes of water to improve understanding of hydrological processes including coupled land-atmosphere processes.

Some highlights from 2010 include:

Meetings and Workshops:

- International Symposium on isotopes in Hydrology, Marine Ecosystems, and Climate Change Studies 27 March- 1 April 2011, Monaco, Organized by the International Atomic Energy Agency.
- The Roles of Stable Isotopes in Water Cycle Research: Keystone, Colorado 28 March – 30 March 2011. Sponsored and organized by the Biogeosphere-Atmosphere Stable Isotope Network (BASIN). The goal of the workshop was to review recent advances in the use of stable isotopes as a means to inform and deepen our understanding of ecological, hydrological and atmospheric processes impacting the water cycle.
- Tracer committee members are currently participating in a Co-ordinated Research Project organized by the International Atomic Energy Agency titled “Use of Environmental Isotopes in Assessing Water Resources in Snow, Glacier, and Permafrost Dominated Areas Under Changing Climatic Conditions”. The goal of this project is to assemble isotopic evidence for water derived from snowpack, glaciers, and permafrost in adjacent groundwater and surface waters under present climatic conditions in a variety of snow-and-ice dominated catchments and to evaluate the potential alterations to these relationships under changing climatic conditions. The first meeting was held on 30 Aug.- 4 Sept. 2010 and included cold region hydrologists working in Canada, Georgia, Germany, Japan, Pakistan, Russia, Slovakia, Slovenia and the United States.

Other and ongoing committee activities:

- Maintenance of the Tracer Committee web-site
http://www.science.uwaterloo.ca/~jjgibson/gibson_files/isotope.html
- Support of IAEA/WMO Global Network of Isotopes in Precipitation and Large Rivers Program.
- Liaison and support for expanding national isotope monitoring/science networks (Canada: Canadian Network for Isotopes in Precipitation, United States: USNetwork for Isotopes in Precipitation).

Other News

The isotope hydrology community was saddened to hear of the death of our valued colleague, Gian Maria Zuppi, who passed away on 12 May 2011. Gian Maria was a well-respected hydrologist, who developed isotope techniques for tracing and dating water in the hydrological cycle. He was the present President of the IAHS International Commission on Tracers. A tribute to Prof. Zuppi can be found at <http://iahs.info>.

Applications of Isotopic Tracer Techniques:

The trend in Canadian isotope tracer research has recently been towards sustained long-term monitoring of precipitation and river discharge to enable better characterization of spatial and temporal variability in isotope signatures and their underlying causes.

A number of large-scale research programs using water isotope tracers to better characterize past and present hydrological processes are currently underway in Canada including:

- the **Mackenzie River Basin** as part of the Global Energy and Water Cycle Experiment and the IAEAs Coordinated Research Project (CRP) on Large River Basins,

- the **St. Lawrence River** also as part of the IAEA CRP Large River Basin project,
- the **Peace Athabasca Delta, Slave River Delta, Old Crow Flats, and Wapusk National Park** are all large-scale field programs in which researchers are using water isotope tracers to characterize the water balance of modern lakes as well as using isotopic archives to evaluate changes in hydrology over the last millennium,
- the **Grand River Basin** is the location of an intensive campaign sampling groundwater, river water and precipitation providing the first basin-wide isotopic sampling within the Great Lakes catchment,
- **Nelson River Basin** will be the location of a new 4-year isotope sampling program in which the isotopic composition of rivers, lakes, wetlands, snow, baseflow, precipitation and evaporation will be used to improve the hydrological modelling of the basin using isoWATFLOOD.
- A 5-year study to determine critical loads for nitrogen in Boreal ecosystems is currently being initiated at two field sites near **Fort McMurray**. Isotopic tracing of water and nitrogen will be used to assess the connectivity of bogs, fens and uplands in the region.
- Isotopic tracers are being used in studies focused on the **Athabasca River** near Fort McMurray to try to identify inputs from groundwater seeps and tailings ponds. A pilot study conducted during 2009 and 2010 to assess potential for inorganic and organic labelling of process-affected water from oil sands operations to the Athabasca River can be downloaded at:
<https://era.library.ualberta.ca/public/view/item/uuid:b263c6c6-5de3-43c2-bca3-f5e979fecf2d>

Dissemination

Tracer Committee members have been actively promoting the use of isotope tracer techniques in hydrology through refereed publications, meetings and conferences, as well as supporting the training of highly qualified persons. The Tracer Committee website has been updated to include links to some recent publications. Other dissemination highlights include:

- There is open access to the Journal of Limnology where some of the above-mentioned papers describing the use of isotope-based site-specific estimates of water yield for regional acid sensitivity assessments.
http://www.jlimnol.it/JL_69_sup11/JL_69_sup11.htm

Upcoming Meetings:

- International Association of Hydrological Sciences, 28 June- 7 July 2011: Earth on the Edge: Science for a Sustainable Planet, “Tracer hydrology as a tool for estimating flow parameters, groundwater dynamics, pollution transport and bioremediation processes in heterogeneous systems: , Melbourne, Australia.
- Canadian Water Resources Association, 27-30 June, 2011, “Our Water – Our Life – The Most Valuable Resource”, St. John’s Newfoundland.
- Association of Isotope Geochemists 19-23 September 2011. Tarragona, Spain.

CNIP Subcommittee:

Operation of CNIP continued during the past year, with sampling conducted by the Meteorological Service of Canada and analyses supplied by the Environmental Isotope Laboratory, University of Waterloo. The network consists of 19 stations distributed across Canada (spanning almost 40° of latitude and 70° of longitude) collecting weighted monthly precipitation

samples for $\delta^{18}\text{O}$ and $\delta^2\text{H}$. The majority of CNIP sampling sites are meteorological stations operated by the Meteorological Service of Canada and the Canadian Air and Precipitation Monitoring Network (CAPMoN) with analyses conducted by the Environmental Isotope Laboratory, University of Waterloo. The CAPMoN networks primary use is for monitoring non-urban air quality to establish spatial and temporal trends in atmospheric pollution (e.g. ozone, particulate, smog, acid rain). In addition, CNIP also includes 3 stations where daily precipitation samples are collected for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ analyses. This valuable dataset marks the first time that both the southern and northern regions of the country have been simultaneously sampled, and currently consists of a nine-year dataset for the entire country. This partnering between CNIP and CAPMoN has benefited both parties by creating a comprehensive dataset that includes geochemical as well as isotopic characterization of precipitation chemistry providing additional tracers to constrain source areas and transport history. Between January 1998 and January 2010 over 6000 precipitation samples were received at the Environmental Isotope Laboratory at the University of Waterloo, approximately 5000 of which have already been analyzed.

Meetings and Activities

- Birks, S.J. Edwards, T.W.D. Neelmoy, N.C. Gibson, J.J., Drimmie, R.J., Michel, F. and McTavish, D., Isotope climatology of Canada: Insights from the first decade of CNIP operation (1997-2007), Joint Assembly, The Meeting of the Americas, 24-27 May 2009, Toronto, Canada.
- Maintenance of the CNIP subcommittee web-site,
http://www.science.uwaterloo.ca/~jjgibson/gibson_files/cnip.html

- Maintenance of the CNIP web-site, <http://www.science.uwaterloo.ca/~twdedwar/cnip/cniphome.html>
- Liaison and support for expanding national isotope monitoring/science networks (Canada: Canadian Network for Isotopes in Precipitation, Canadian Geophysical Union Committee on Isotope Tracers and CNIP Subcommittee, Manitoba Network for Isotopes in Precipitation, United States: USNetwork for Isotopes in Precipitation, Australia: GNIP, OzFlux, Bureau of Meteorology, CSIRO, ANSTO)

Erosion and Sedimentation Committee

Chair: Peter Ashmore, Department of Geography, University of Western Ontario, London, ON, N6A 5C2, Email: pashmore@uwo.ca

Members:

Dr. Dirk DeBoer, University of Saskatchewan
 M. Conly, Environment Canada (CWS), Saskatoon
 Dr. M. Church, University of British Columbia
 Dr. A. Roy, Université de Montréal
 Dirk DeBoer IAHS-International Commission on Continental Erosion Canadian Delegate

Objectives:

The scientific advancement and practical application of knowledge of erosion, transport and deposition of sediment in fresh water systems - topic coverage similar to that of the IAHS Commissions on Continental Erosion some aspects of Water Quality.

i) communication of current research via discussion, meetings, conferences and publications;

- ii) identification and promotion of high priority research topics in the Canadian context;
- iii) promotion and encouragement of the transfer of knowledge and technology in the field of interest.

Meetings & Activities

- Continued representation of E&S topics at CGU-HS sessions, including 2011 meeting.
- Reciprocal membership arrangement and affiliation between CGU and Canadian Geomorphology Research Group has resulted in several sessions at other national conferences.
- Currently developing initial suggestions for sessions at CGU 2012 with CWRA and with CGRG (who are planning their annual meeting at CGU in 2012) on topics in the general area of hydro-geomorphology, and watershed and channel restoration.
- Phil Owens (UNBC) is member of ICCE scientific committee for meeting in Chengdu “Erosion and sediment yields in the changing environment”, October 2012.
- Mike Stone (Waterloo) is incoming ICCE President.
- Canada hosted the 7th International Workshop on Gravel Bed Rivers in Tadoussac, Quebec, September 2010. A. Roy was conference Chair and the organization and scientific activities were done entirely by a group of Canadian geomorphologists and hydrologists, and sponsored by several Canadian universities, public agencies and private companies. A conference book (lead editor M. Church) and special issue of Earth Surface Processes and Landforms (co-editors P. Ashmore and C. Rennie) are forthcoming.