



## HYDROLOGY SECTION NEWS

*Prepared by Sean Carey, President, CGU-Hydrology Section*

### CGU HYDROLOGY SECTION COMMITTEE REPORTS 2013

#### 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 have focused on preparing for the 19<sup>th</sup> Northern Research Basins Symposium and Workshop in Alaska, August 11 – 17, 2013. The conference theme is **Water Resources: Developments in a Changing Environment**. Full details of the meeting and the proceedings can be found at [www.19thnrb.com](http://www.19thnrb.com).

As outlined in the NRB Mandate and the Canadian NRB Terms of Reference, Canada can send delegates invited by the Canadian Chief Delegate (and approved by the CGU-HS Executive). The current proposed delegation represents a diversity of expertise relevant to the theme of the symposium and workshop. It is larger than the standard ten delegates, but some of the proposed delegates still require employer approval. Secondly, five of the delegates are students, important to ensure the long term viability of Canadian delegations to the NRB.

<b>Name</b>	<b>Affiliation</b>
Chris Spence	Environment Canada
Ric Janowicz	Yukon Territorial Government
Terry Prowse	Environment Canada
Kathy Young	York University
Ming-ko Woo	McMaster University
William Quinton	Wilfrid Laurier University
Rita Winkler	BC Ministry of Forests
Phil Marsh	Environment Canada
Roxanne Ahmed	University of Victoria
Allison Bawdon	University of Waterloo
Hayley Linton	University of Victoria

Brandi Newton	University of Victoria
Gillian Walker	University of Victoria

Canada continues to be responsible for the main NRB websites and NRB listserv; maintained through a contract with Laura Brown. These web sites: [www.canadiannrp.com](http://www.canadiannrp.com) and [www.northernresearchbasins.com](http://www.northernresearchbasins.com) contain information about the working group, the Canadian committee, past meetings, links to relevant websites, numerous photos, and the 19<sup>th</sup> NRB. Contact Chris Spence at [chris.spence@ec.gc.ca](mailto:chris.spence@ec.gc.ca) for more information.

## **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 in the water survey, in understanding of precipitation processes and for regional, national and global networks that serve to build scientific capacity for tracer-based research. Some highlights from 2011-12 include:

The Water Survey of Canada, in cooperation with the University of Manitoba, University of Victoria, and Alberta Innovates Technology Futures, is supporting development of a national pilot network to demonstrate the value in systematic collection of river discharge and analysis for oxygen-18 and deuterium across Canada. Water sampling of several hundred key gauging stations is expected to commence in 2012-13. Further information can be obtained from John Gibson ([jjgibson@uvic.ca](mailto:jjgibson@uvic.ca)).

An important precipitation isotope summary was published this year that explores the ability to model the spatial distribution of oxygen-18 isotopes in precipitation across Canada (Delavau et al. 2011). The paper utilizes the Canadian Network for Isotopes in Precipitation (CNIP) database. For more information contact Carly Delavau ([umdelav0@cc.umanitoba.ca](mailto:umdelav0@cc.umanitoba.ca)). Research on the isotopic labeling of precipitation in the arctic is being conducted by Fred Michel in collaboration with Dr. Feng at Dartmouth college in New Hampshire.

Jean Birks is leading the Canadian contribution to an International Atomic Energy Agency sponsored research program on “Use of Environmental Isotopes in Assessing Water Resources in Snow, Glacier, and Permafrost Dominated Areas under Changing Climatic Conditions”. In addition to describing the value of synoptic river surveys for large northern rivers (e.g. Yi et al. 2009), Canada is participating in a pilot study for testing the representativeness of snow lysimeters, snow cores, and Frisbee samplers. For more information contact Jean Birks ([jean.birks@albertainnovates.ca](mailto:jean.birks@albertainnovates.ca)).

Isotopic tracers methodology for estimating water yield to ungauged lakes has been incorporated within Environment Canada’s Oil Sands monitoring plan (see Environment Canada 2011). This strategy has previously been used by the Regional Aquatic Monitoring Program (RAMP) and by Environment Canada’s Acid Rain program to better understand site-specific hydrologic conditions across Canada (Gibson et al. 2010a,b). For more information contact John Gibson ([jjgibson@uvic.ca](mailto:jjgibson@uvic.ca)) or Jean Birks ([jean.birks@albertainnovates.ca](mailto:jean.birks@albertainnovates.ca)).

Isotope tracers will be widely featured at the upcoming Goldschmidt Conference: Earth in Evolution to be held in Montreal during June 24-29 2012. Two sessions that will be convened by members of the isotope tracer committee including: 22c. Applications of

emerging geochemical and isotopic analytical techniques for integrated water resource management and environmental monitoring, and 14e. New developments in understanding natural and anthropogenic water contaminants in the Athabasca oil sands region. Both sessions will highlight advances made in use of isotopic tracers. For more information contact Yi Yi ([yyi@uvic.ca](mailto:yyi@uvic.ca)).

Alberta Innovates Technology Futures and the Canadian Water Network are sponsoring an Oil Sands Water Research Colloquium on Surface and Groundwater Management in the Oil Sands Industry to be held June 6, 2012. The session will include discussion of isotopic and geochemical methods for fingerprinting water sources. For more information contact Jean Birks ([jean.birks@albertainnovates.ca](mailto:jean.birks@albertainnovates.ca)).

A special session will be held at the next Geological Society of America 2012 ANNUAL MEETING to be held in Charlotte, North Carolina, November 4-7 2012, co-sponsored by CGU committee on isotopic tracers, entitled "Biotracers, Mineralogical and Geochemical Properties of Circum-Arctic Sediment Sources and Runoff towards the Arctic Ocean (TS 123)". A large community is presently planning a drilling program in the Arctic Ocean in order to set up a robust geological history of the basin. One critical issue is to link detrital sediments to circum-Arctic sources using mineralogical, elemental and isotopic tracers as well as biotracers. Geoscientists with experience in surficial deposits, bedrock, major rivers and estuarine systems in surrounding lands, on ocean margin- and deep sediments are invited to contribute with reviews and new information about the mineralogy, geochemistry and biological/organic content of such potential sediment sources and their variability through time. Applications to issues such as changes in continental erosional rates and mechanisms are also welcome. For information contact Dennis Darby ([ddarby@odu.edu](mailto:ddarby@odu.edu)) or Claude Hillaire-Marcel ([chm@uqam.ca](mailto:chm@uqam.ca)).

One important new research program underway is NSERC Discovery Frontiers Program: ADAPT: Arctic Development and Adaptation to Permafrost in Transition (PI Vincent; 2011-2016). This multidisciplinary and multi-faceted research program broadly addresses the fundamental research question: "What are the implications of rapid environmental change in Canada and the circumpolar North caused by thawing permafrost conditions?" Co-PI Brent Wolfe's (WLU) research will identify linkages among hydrological processes, limnological conditions and greenhouse gas exchange in thermokarst lakes. This is important because climate-driven alterations to lake-water balances (e.g., greater evaporation due to longer ice-free seasons, changes in precipitation regimes, accelerated permafrost thaw and more frequent lake drainage events) may influence limnological properties and hence greenhouse gas evasion rates. Research will utilize water isotope tracers and other approaches in present and past hydroecological studies of thermokarst lakes located in the subarctic discontinuous permafrost region in Nunavik and the continuous-discontinuous permafrost region in the western Hudson Bay Lowlands. For further information contact Brent Wolfe ([bwolfe@wlu.ca](mailto:bwolfe@wlu.ca))

**References cited:**

Delavau, C. Stadnyk, T., Birks, S.J., 2011. Model based spatial distribution of oxygen-18 isotopes in precipitation across Canada. submitted to the Canadian Water Resources Journal. Aug. 16, 2011.

Environment Canada, 2010. Integrated Monitoring Plan for the Oil Sands: Expanded Geographic Extent for Water Quality and Quantity, Aquatic Biodiversity and Effects, and Acid Sensitive Lakes Component, F. Wrona, P. diCenzo, K. Schaefer (eds.), Ottawa, Canada, p. 70.

Gibson, J.J., Birks, S.J., McEachern, P., Hazewinkel, R., Kumar, S., 2010a. Interannual variations in water yield to lakes in northeastern Alberta: Implications for estimating critical loads of acidity. *Journal of Limnology* 69 (Suppl. 1) 126-134, 2010 - DOI: 10.3274/JL10-69-S1-13.

Gibson, J.J., Birks, S.J., Jeffries, D.S., Kumar, S., Scott, K.A., Aherne, J., Shaw, P., 2010b. Site-specific estimates of water yield applied in regional acid sensitivity surveys in western Canada. *Journal of Limnology* 69 (Suppl. 1) 67-76, 2010 - DOI: 10.3274/JL10-69-S1-08.

Yi, Y., Gibson, J.J., Helie, J.-F., Dick, T.A., 2009. Synoptic and time-series stable isotope surveys of the Mackenzie River from Great Slave Lake to the Arctic Ocean, 2003 to 2006. *Journal of Hydrology* Volume 383, pp.223-232, doi:10.1016/j.jhydrol.2009.12.038.

**Recent publications in the field:**

A number of recent contributions have been published that describe application of isotopic tracers in hydrologic studies. These include:

Azcurra, C.S., Hughes, C.E., Parkes, S., Hollins, S.E., Gibson, J.J., McCabe, M.F., Evans, J.P., 2011. A comparison between direct and pan-derived measurements of the isotopic composition of atmospheric waters. 19th International Congress on Modelling and Simulation, Perth, Australia, 12-16 December 2011, <http://mssanz.org.au/modsim2011>.

Buhay WM, BB Wolfe and A Schwalb. 2012. Lakewater paleothermometry from Deep Lake, Minnesota during the deglacial-Holocene transition from combined  $\delta^{18}\text{O}$  analyses of authigenic carbonate and aquatic cellulose. *Quaternary International* 260: 76-82.

Hughes, C.E., Stone, D.J.M., Gibson, J.J., Meredith, K.T., Sadek, M.A., Cendon, D.I., Hankin, S.I., Hollins, S.E., Morrison, T.N., 2012. Stable water isotope investigation of the Barwon-Darling River system, Australia. IAEA Tecdoc 1673, pp. 95-110, International Atomic Energy Agency, Vienna, Austria, ISBB 978-92-0-126810-5.

MacDonald LA, AM Balasubramaniam, RI Hall, BB Wolfe and JN Sweetman, 2012. Developing biomonitoring protocols for shallow Arctic lakes using diatoms and artificial substrate samplers. *Hydrobiologia* 683: 231-248.

MacDonald LA, KW Turner, AM Balasubramaniam, BB Wolfe, RI Hall and JN Sweetman. 2012. Tracking hydrological responses of a thermokarst lake in the Old Crow Flats (Yukon Territory, Canada) to recent climate variability using aerial photos and paleolimnological methods. *Hydrological Processes* 26: 117-129.

Mayer, B. & Wassenaar, L., I. (2012): Isotopic characterization of nitrate sources and transformations in Lake Winnipeg and its contributing rivers, Manitoba, Canada. – *Journal of Great Lakes Research*, published on-line on March 10, 2012.

Nightingale, M. & Mayer, B. (2012): Identifying sources and processes controlling the sulphur cycle in the Canyon Creek watershed, Alberta, Canada. – *Isotopes in Environmental & Health Studies*, 48(1): 89-104.

McGowan S, PR Leavitt, RI Hall, BB Wolfe, TWD Edwards, T Karst-Riddoch and SR Vardy. 2011. Interdecadal declines in flood frequency increase primary production in lakes of a northern river delta. *Global Change Biology* 17: 1212-1224.

Wiklund JA, RI Hall and BB Wolfe. 2012. Timescales of hydrolimnological change in floodplain lakes of the Peace-Athabasca Delta, northern Alberta, Canada. *Ecohydrology* 4: (in press).

Wolfe BB, EM Light, ML Macrae, RI Hall, K Eichel, S Jasechko, J White, L Fishback and TWD Edwards. 2011. Divergent hydrological responses to 20th century climate change in shallow tundra ponds, western Hudson Bay Lowlands. *Geophysical Research Letters* 38, L23402, doi:10.1029/2011GL049766.

Wolfe BB, TWD Edwards, RI Hall and JW Johnston. 2011. A 5200-year record of freshwater availability for regions in western North America fed by high-elevation runoff. *Geophysical Research Letters* 38, L11404, doi:10.1029/2011GL047599.

Yi, Y., Gibson, J.J., Cooper, L.W., McClelland, J.M, Holmes, R.M, Peterson, B., Isotopic signals ( $^{18}\text{O}$ ,  $^2\text{H}$ ,  $^3\text{H}$ ) of six major rivers draining the Pan-Arctic watershed, *Global Biogeochemical Cycles*, 26, GB1027, doi: 10.1029/2011GB004159.

### **Recent graduate theses focused on isotopic tracers:**

Chao, J. Major ion and stable isotope geochemistry of the Bow River, Alberta, Canada. MSc (Geoscience, University of Calgary).

Jasechko, S., 2011. Stable isotope mass balance of the North American Laurentian Great Lakes, M.Sc. Thesis (Earth Sciences Univ. Waterloo).

Light (Dobson) E. 2011. Characterizing the present and past hydrology of shallow ponds in the Churchill area using isotopic methods. MSc (Geography and Environmental Studies WLU). Recipient of Wilfrid Laurier University Gold Medal for Academic Excellence.

Proemse, B. C. Tracing Industrial Emissions in the Athabasca Oil Sands Region Using Stable Isotope Techniques. PhD (Geoscience, University of Calgary).

Tattie, K., Groundwater surface water interactions in a wetland rich low relief Boreal environment. M.Sc. Thesis (Geography Univ. Victoria).

White J. 2011. Characterizing current and past hydroecological conditions in shallow tundra ponds of the Hudson Bay Lowlands. MSc (Biology Univ. Waterloo).

Wiklund J. 2012. Lakes of the Peace-Athabasca Delta: Controls on nutrients, chemistry, phytoplankton, epiphyton and deposition of polycyclic aromatic compounds (PACs). PhD (Biology Univ. Waterloo).

### **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, University of Waterloo

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.

- 2012 meeting includes sessions HRW 9 and 10, "Biogeomorphology- interactions between riparian ecosystems, aquatic ecosystems and stream channels" and "Fluvial responses to environmental change".
- Co-sponsor with CGRG of sessions R1 and R2: "Hypothesis-driven science: linking field observations to earth-surface processes" and "Advances in fluvial and glacial geomorphology".
- Reciprocal membership arrangement and affiliation between CGU and Canadian Geomorphology Research Group has resulted in sessions at other national conferences.
- 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.
- Committee meeting at CGU 2012 conference will consider new leadership and members, and future directions for the Committee.

### **Canadian National Committee for IAHS (CNC-IAHS) – Annual Report 2013**

#### **Roles and objectives**

- to promote and support hydrology as a geoscience within National and among International communities;
- to encourage and promote the collaboration between IAHS and Canadian scientific organisations and institutions;
- to encourage and promote the participation of Canadian scientists in IAHS and its activities;
- to initiate cooperative research and education programmes in hydrology with IAHS ;
- to respond, on behalf of Canada, to scientific requests from IAHS;
- to undertake the dissemination and transfer of information on IAHS-related activities among Canadian hydrologists;
- to seek and support the nomination of Canadian hydrologists to Executive positions of IAHS;
- to arrange the selection and nomination of National Representatives to IAHS, IAHS Commissions and Committees.

#### **Current Executive**

Senior Rep. and Chair	Dan Moore, UBC
Junior Rep. and Secretary	William Quinton, Wilfrid Laurier University
President, CGU-HS	Sean Carey, McMaster University
Vice-President, CGU-HS	William Quinton, Wilfrid Laurier University
CMOS Rep.	Pierre Gauthier
CWRA/CSHS Rep.	Wayne Jenkinson
CNC-IAH Rep.	Garth van der Kamp, Environment Canada
Member-at-large, CGU-HS	Masaki Hayashi, University of Calgary



## Canadian National Representatives to IAHS Commissions

### International Commission

Surface Water

Groundwater

Water Quality

Continental Erosion

Coupled Land-Atmosphere Systems

Remote Sensing

Water Resources Systems

Snow and Ice Hydrology

Tracers

### Representative

Don Burn, Univ. of Waterloo

Masaki Hayashi, Univ. of Calgary

Brian Branfireun, Univ. of Western Ontario

Mike Stone, University of Waterloo

Rich Petrone, Wilfrid Laurier Univ.

Al Pietroniro, Environment Canada

Slobodan Simonovic, Univ. of Western Ontario

Sean Carey, Carleton Univ.

John Gibson, Alberta Research Council

### Canadian Activities Related to IAHS

Canadians made substantial contributions to activities of several IAHS Commissions over the last year, in particular the International Commission on Tracers and the International Commission on Continental Erosion. See separate reports in this issue of *Elements* submitted by the CGU-HS Committees on Isotopic Tracers and Erosion and Sedimentation for details.

Canadians also made significant contributions to the final reporting phase of the IAHS PUB (Prediction in Ungauged Basins) initiative, resulting in the following publications:

Hrachowitz, M., Savenije, H.H.G., Blöschl, G., McDonnell, J.J., Sivapalan, M., Pomeroy, J.W., Arheimer, B., Blume, T., Clark, M.P., Ehret, U., Fenicia, F., Freer, J.E., Gelfan, A., Gupta, H.V., Hughes, D.A., Hut, R.W., Montanari, A., Pande, S., Tetzlaff, D., Troch, P.A., Uhlenbrook, S., Wagener, T., Winsemius, H.C., Woods, R.A., Zehe, E., and Cudennec, C., 2013. A decade of Predictions in Ungauged Basins (PUB)—a review. *Hydrological Sciences Journal*, 58 (6), doi: 10.1080/02626667.2013.803183.

Moore, R.D., Woods, R.A. and Boyle, D.P. 2013. Putting PUB into practice in mountainous areas. *Streamline Watershed Management Bulletin* 15(2), 12–21.

Pomeroy, J.W., C. Spence, and P.H. Whitfield [ed]. 2013. Putting Predictions in Ungauged Basins into Practice: Proceedings of the Predictions in Ungauged Basins Workshop. Canmore, Alberta. May 2011. Canadian Water Resources Association and International Association of Hydrological Sciences.