

# Elements



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## THE NEWSLETTER OF THE CANADIAN GEOPHYSICAL UNION

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## LE BULLETIN DE L'UNION GÉOPHYSIQUE CANADIENNE

### President's Column

In this issue, I would like to update you on planning for the upcoming joint CGU-AGU-SEG-EEGS meeting to be held in Montreal May 17-21, 2004.

Planning for this important meeting is progressing well with the joint technical program committee developing a strong series of sessions on a broad range of topics, including:

Atmospheric Sciences  
Biogeosciences  
Geodesy  
Geomagnetism and Paleomagnetism  
Hydrology  
Ocean Sciences  
Planetary Sciences  
Seismology  
Space Physics and Aeronomy  
Tectonophysics  
Volcanology, Geochemistry, and Petrology  
Cryosphere  
Global Environmental Change  
Mineral and Rock Physics  
Education and Human Resources

Complete session details, will be available at:

<http://www.agu.org/meetings/sm04/>

**The STRICT deadlines for both postal and online abstract submissions are:**

12 February 2004: Deadline for abstract submissions by postal or express mail.

19 February 2004, 2359 UT: Deadline for electronic online abstract submissions.

As in past years, the CGU will be presenting the following Student Awards for *oral* presentations by CGU Members:

CGU Best Student Paper Award (all fields of geophysics)  
D.M. Gray Award for Best Student Paper in Hydrology  
Chevron Canada Outstanding Student Paper in Seismology  
Geodesy Award for Best Student Paper in Geodetic Research & Education

and for *poster* presentations:

Campbell Scientific Award for Best Student Poster in Hydrology  
Shell Canada Best CGU Student Poster Award (other than hydrology)

Please note that due to the joint meeting, deadlines may be different than in previous years. Please check the CGU Web Page for details as they become available:

<http://www.cgu-ugc.ca/>

In addition to these awards, CGU solicits nominations for the J. Tuzo Wilson Medal. The Union

gives this award annually to recognize scientists who make outstanding contributions to Canadian geophysics. Factors taken into account in the selection process include excellence in scientific or technical research, instrument development, industrial applications and/or teaching. If you would like to nominate a candidate please contact CGU Awards Committee Chair. Details are available at:

<http://www.cgu-ugc.ca/medal/intro.html>

Other meetings co-sponsored by CGU in the upcoming year include:

15th International Symposium on Earth Tides, 2-6 August 2004, Ottawa, Canada

11th International Symposium on Deep Structure of the Continents and their Margins, 26 September – 1 October, 2004, Mont-Tremblant, Quebec, Canada

And finally, in 2005, CGU will be back in Banff with a meeting between May 8-11.

Thank you for your continuing support of the CGU and look forward to seeing you in Montreal.

--- Philip Marsh

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### **CGU 2004 Annual Scientific Meeting, Montreal, May 17-21**

**A Joint Meeting with the AGU (American Geophysical Union),  
the Society of Exploration Geophysicists (SEG),  
and the Environmental and Engineering Geophysical Society (EEGS)**

**Venue: Palais des congrès de Montréal ([www.congresmtl.com/en/index.php](http://www.congresmtl.com/en/index.php))**

***Abstract Deadline: 12 Feb. 2004 (mailed); 19 Feb 2004, 2359 UT (online)***

**AGU Contact: AGU Meetings Department, 2000 Florida Avenue, NW,  
Washington, DC 20009 USA.**

**Phone: +1-202-777-7333; Fax: +1-202-328-0566; E-mail: [meetinginfo@agu.org](mailto:meetinginfo@agu.org)**

**Web Site: <http://www.agu.org/meetings/>**

**See also the CGU website: <http://www.cgu-ugc.ca>**

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#### **NS2004: Near-Surface Geophysics Focus at AGU (American Geophysical Union) 2004 Spring Meeting**

Rosemary Knight, Dept. of Geophysics, Stanford University ([rknight@stanford.edu](mailto:rknight@stanford.edu))

The AGU Spring Meeting, a Joint Assembly of the AGU, the Canadian Geophysical Union (CGU), the Society of Exploration Geophysicists (SEG), and the Environmental and Engineering Society (EEGS), is being held May 17-21, 2004 in Montreal (for more information see <http://www.agu.org/meetings/sm04/>). The theme of the meeting is Science Serving Society. A highlight of the meeting is a focus on near-surface geophysics that will involve two to three days of sessions, bringing together

geophysicists from different countries and professional societies under the banner: **Geophysics - Finding Solutions**. This near-surface focus, referred to as NS2004, is a collaborative effort with participation and support from AGU, SEG (Society of Exploration Geophysicists), EEGS (Environmental and Engineering Geophysical Society), and the Near Surface Geosciences Division of EAGE (European Assoc. of Geoscientists and Engineers).

The NS2004 near-surface geophysics sessions are intended to:

- 1) cross professional-society and international boundaries to bring together, in Montreal, a large component of the near-surface geophysics community.
- 2) communicate to others (the end-users of our information such as hydrologists, environmental scientists and engineers, government agencies) the value and importance of geophysics in finding solutions.

The current list of sessions is:

Near-Surface Geophysics: Evaluation and Management of Water Resources  
Near-Surface Geophysics: Contaminant Hydrology  
Near-Surface Geophysics: Analysis of Hazards  
Near-Surface Geophysics: Evaluation of Transportation and Resource Infrastructure  
Near-Surface Geophysics: Climate Change and Earth's Surficial Processes

Each topic will be covered over one half-day at the meeting; so we are currently planning two and a half days for NS2004. All of the full presentations will take place in poster sessions. For each topic, however, we will start with a short oral session. This oral session will include an introduction to the topic for which we are exploring geophysical approaches/solutions, and a 2-minute, 2-slide, advertisement for each poster. The poster “advertisement”

will serve to interest other geophysicists in the poster but will also communicate the “serving society” and “finding solutions” role of the work to the non-geophysicists in the audience.

For more information, please contact any member of the NS2004 planning committee:

Jeff Daniels (jeff@geology.ohio-state.edu)  
Rosemary Knight (rknight@pangea.stanford.edu)  
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For up-to-date information on NS2004, please go to:

<http://pangea.stanford.edu/GP/faculty/rknight/NSComm.html>

and select “Upcoming Events/Conferences”.

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## J. Tuzo Wilson Medal – Call for Nominations

The Executive of the CGU solicits nominations for the J. Tuzo Wilson Medal – 2004. The Union makes this award annually to recognize outstanding contributions to Canadian geophysics. Factors taken into account in the selection process include excellence in scientific or technical research, instrument development, industrial applications and/or teaching.

If you would like to nominate a candidate, please contact the Chair of the CGU Awards Committee. At a minimum, the nomination should be supported by letters of recommendation from colleagues, a brief biographical sketch and a Curriculum Vitae. Nominations should be submitted by February 28, 2004. Additional details concerning the nomination process can be obtained from the Chair of the CGU Awards Committee (see the last page).

L'exécutif de l'UGC vous invite à suggérer des candidats pour la médaille J. Tuzo Wilson – 2004. L'Union décerne la médaille chaque année “en reconnaissance d'une contribution remarquable à la

géophysique canadienne”. En choisissant parmi les candidats, on considère les accomplissements en recherches scientifique ou technologiques, aux développements d'instruments, aux applications industrielles et/ou à l'enseignement.

Si vous désirez suggérer un candidat pour cette médaille, s.v.p. contacter le Président du Comité des Prix d'Excellence. Les nominations doivent être supportées de lettres de recommandation de collègues, d'un bref sommaire biographique et d'un Curriculum Vitae. Les nominations doivent être soumises avant le 28 février, 2004. Des détails additionnels concernant le processus de nomination peuvent être obtenus en communiquant avec le Président du Comité des Prix d'Excellence de l'UGC (voir la dernière page).

### *Past Wilson Medallists*

1978	J. Tuzo Wilson
1979	Roy O. Lindseth
1980	Larry W. Morley

1981	George D. Garland	1993	Alan E. Beck
1982	Jack A. Jacobs	1994	Michael J. Berry
1983	D. Ian Gough	1995	Charlotte Keen
1984	Ted Irving	1996	Petr Vaníček
1985	Harold O. Seigel	1997	Chris Beaumont
1986	Michael Rochester	1998	Ron M. Clowes
1987	David Strangway	1999	David Dunlop
1988	Ernie Kanasewich	2000	Don Gray
1989	Leonard S. Collett	2001	Roy Hyndman
1990	Gordon F. West	2002	Doug Smylie
1991	Thomas Krogh	2003	Garry K.C. Clarke
1992	R. Don Russell		

## The POLARIS Project / Natural Hazards session at the 2003 CGU conference, May 10-14, Banff

D. Eaton, University of Western Ontario

As the first scientific meeting of the POLARIS (Portable Observatories for Lithospheric Analysis and Research Investigating Seismicity) Project, this session was a significant milestone. The session comprised 10 oral presentations, 14 posters, and a panel discussion.

The first set of oral presentations focussed on POLARIS studies of earthquake hazards and continental dynamics. The first talk of the morning, given by Isa Asudeh, provided an overview of the POLARIS project, including its scientific objectives and research infrastructure (see [www.polarisnet.ca](http://www.polarisnet.ca) for details). After this, a series of 5 case histories described applications of POLARIS and other passive geophysical datasets to lithospheric studies. Andrea Letkeman (University of Manitoba) described a study of the deep structure of the Grenville Province in Ontario using teleseismic receiver functions computed from 45 events recorded at the Canadian National Seismograph Network station SADO. The results provide evidence for an anisotropic layer in the upper mantle, at 60 km depth. Next, Andrew Frederiksen (University of Manitoba) used data from POLARIS stations around SADO to infer that this upper mantle anisotropic layer is laterally extensive in Ontario. Mantle layering is particularly well documented in the Slave craton of northwestern Canada, as outlined in the next presentation by David Snyder (Geological Survey of Canada). Teleseismic analysis utilizing receiver functions and shear-wave splitting, coupled with magnetotelluric studies of the electrical structure of the lithosphere, correlate well with xenolith suites entrained in kimberlites. In the next talk, Ian Ferguson (University of Manitoba) presented preliminary results from an 11-station magnetotelluric campaign in Ontario, September 2002. 2D responses were found at 8 of the sites, with an overall northeast-southwest electrical strike direction. The final

talk in this set, by Colin Thomson (Queens University), provided a comprehensive analysis of teleseismic data collected in the Superior Province of northwestern Ontario. A combination of teleseismic tomography, shear-wave splitting and surface-wave inversion studies provide constraints on a subduction model for the formation of this Archean craton.

The second set of oral presentations focussed on natural hazards aspects of earthquake studies. The set started off with an invited presentation by Won-Young Kim (Lamont Doherty Earth Observatory) about the April 20, 2002 Au Sable Forks earthquake. This Mw 5.0 event was widely felt in northeastern states, Ontario and Quebec and produced minor damage near the epicentre. Using 60 broadband seismic recordings, including 10 POLARIS stations, the source mechanism was found to be thrusting on a 45 degree dipping plane striking due south. Next, John Adams (Geological Survey of Canada) described how POLARIS data are being archived and integrated into the GSC's automatic event location and earthquake alert service. The addition of POLARIS stations in central and eastern Ontario has lowered the completeness threshold for the earthquake catalogue from  $\sim M=2$  to  $M=1.5$ . Amanda Bustin (University of Victoria) gave a presentation about the determination of fault parameters for the February 28, 2001 Mw=6.8 Nisqually earthquake, near Seattle, using GPS and InSAR measurements. Two nucleation scenarios, one in the crust and the other in the mantle, were considered. Finally Lucinda Leonard (University of Victoria) compared estimates of coseismic subsidence during the 1700 Great Cascadia Megathrust earthquake with predictions from elastic dislocation modelling. Good agreement was found, with evidence for maximum coseismic slip along the subduction thrust zone of up to 36 m, near the Washington-Oregon border.

Alan Levander (Rice University) led off the afternoon panel discussion with a presentation on the status of Earthscope, a large-scale project funded by the U.S. National Science Foundation. The aim of Earthscope is to apply modern observational, analytical and telecommunications technologies to investigate the structure and evolution of the North American continent and the physical processes controlling earthquakes and volcanic eruptions (see [www.earthscope.org](http://www.earthscope.org) for details). This was followed by a discussion of how to optimize scientific linkages and collaboration between the POLARIS and Earthscope initiatives. The subsequent

poster session in the afternoon was very well attended and included presentations on user-friendly software for displaying and analyzing POLARIS data; earthquake site response and real-time ShakeMaps; influence of Earth resistivity on geomagnetically induced currents in Manitoba; and, aseismic slip on the northern Cascadia subduction zone. All of the participants in the session are sincerely thanked for making the inaugural POLARIS scientific workshop a success.



## HYDROLOGY SECTION NEWS

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### Canadian Geophysical Union – Hydrology Section Ontario Student Conference 2003

Contributed by: **Brian Branfireun**, Department of Geography, University of Toronto at Mississauga, 3359 Mississauga Rd. N., Mississauga, ON. L5L 1C6. Email: [brian.branfireun@utoronto.ca](mailto:brian.branfireun@utoronto.ca)

On December 5, 2003 the third annual CGU-HS Ontario Student Conference was hosted by the Department of Geography, University of Toronto at Mississauga. The conference is intended as a forum for graduate students in the hydrological sciences to present their proposed, ongoing, and completed research. The previous two student conferences were held at McMaster University in 2001, and last year at York University. Both of these were well attended and scientifically rewarding. This year was again a wonderful demonstration of the depth and diversity of research that the next generation of scientists is bringing to the hydrological discipline. With a grand total of 18 speakers from 9 universities, the day appeared very long on paper, but the quality of the presentations made the sessions flow effortlessly.

The conference was opened with welcomes from the Vice-President and Principal of the University of Toronto at Mississauga, Ian Orchard, and the Chair of the Department of Geography, Ferenc Csillag. The morning session began with four speakers focusing on cold regions

hydrology. M. Marosz-Wantuch (U. of Toronto with D. S. Munro and R. D. Moore) presented a model of snowline migration and runoff response for Place Glacier basin, followed by C. Mongeon (Wilfred Laurier U. with B. B. Wolfe and T. W. D. Edwards) who presented the development of a historical perspective on hydrological variations in the Slave Delta, NWT using sediment organic carbon, nitrogen, and oxygen isotopes. S. Yi (McMaster U. with M.A. Arain, M.K. Woo and M. Mollinga) gave a presentation of modeling efforts to improve the algorithms used to simulate freeze-thaw processes in Arctic, boreal and temperate regions. The first morning session closed with a talk by M. Falcone (U. of Waterloo with T.W.D. Edwards, and B.B. Wolfe) on the use of water isotope tracers to better understand the nature of lake-river water exchanges in the Peace-Athabasca Delta.

After a refreshment break, the theme of the talks tended towards biogeochemistry, with the first speaker T. Labenki (U. of Toronto with M. Diamond, J. Truong, D. Lapierre, B. Branfireun) showing the first results of her

experimental work to characterize the chemical constituents (primarily organic contaminants) that wash off from impervious surfaces in urban environments. J. R. VanHaarlem (Wilfred Laurier U. with R. Petrone and P. Lafleur) outlined his proposed research concerned with the seasonal variation of carbon dioxide fluxes of the low Arctic Tundra near Daring Lake, NWT. K. Lund (York U. with K. L. Young) spoke about her findings on the potential for contaminant transport in high arctic soils from three research sites using a lithium tracer method. A second presentation on carbon dioxide was made by P. Cahil (Laurier U., with R. M. Petrone, M. English and M. Macrae) focused on the local net ecosystem exchange among riparian and other land-use types in an agricultural basin in S. Ontario. The last speaker before the lunch break was M. Khomik (McMaster U. with A. Arain) who presented data on soil carbon dioxide fluxes from white pine forest stands of different ages.

The first afternoon session focused on various approaches to modeling hydrological processes, and was led off by T. Standnyk (U. of Waterloo with N. Kouwen) and outlined the development of an isotope tracer module for the WATFLOOD program for the purpose of using stable isotopes to validate modelled flow paths. N. St. Amour (U. of Waterloo with J. J. Gibson, T. W.D. Edwards, T. D. Prowse, A. Pietroniro) presented research on the use of isotopes to partition streamflow components in wetland dominated catchments, Lower Liard River basin, NWT. This was followed by a presentation on novel computational methods of interpolation with flowlines in anisotropic fluvial environments by J. Wintermute (U. Windsor with P. Graniero). The final talk before the afternoon coffee break was by A. James (McGill U. with N. Roulet), on the topic of testing mixing models to examine runoff generation in a series of nested catchments at Mt. St. Hilaire, Quebec.

The last afternoon session was dominated by a wetland theme. The important role of ebullition

(bubble flux) to peatland methane emissions was reported by M. Strack (McMaster U. with E. Kellner and J. M. Waddington). T. P. Duval (York U. with A.R. Hill) presented data demonstrating the importance of seasonal flow reversals on the nitrogen dynamics of riparian zones. S. C. Kaufman (Wilfred Laurier U. with J.M. Waddington, B.A. Branfireun and R.A. Bourbonniere) showed the importance of hydrogeomorphic controls on the hydrological connection and isolation of a temperate hardwood swamp from surface streams in wet and dry conditions, respectively. Short-term changes in peat pore water chemistry and redox potential were demonstrated through the use of both laboratory and field experimental approaches and presented by C. P. J. Mitchell (U. of Toronto with B. A. Branfireun). The last presentation of the day was by J. Mueller (Wilfred Laurier U. with M. C. English, and P. J. Dillon) on the role of antecedent wetland on the hydrological response of Canadian Shield catchments. Members interested in obtaining a full conference program (including abstracts) can contact me, Brian Branfireun at (: brian.branfireun@utoronto.ca).

I would like to thank Scott Munro (U. of Toronto Geography) and Vince Robinson (U. of Toronto Geography) for graciously offering to serve as session chairs, and for their effective management of the speakers and the many questions from the audience. I would also like to extend my gratitude to Carl Mitchell (PhD candidate, U. of Toronto) and Steven Guenther (undergraduate, U. of Toronto) for their efficient handling of the registrations.

CGU-HS President Spyros Beltaos stated in his closing remarks that he felt that the future of hydrological science in Canada was in good hands. I am certain that the many faculty in attendance were in full agreement.

Brian Branfireun

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### For information on the CGU, such as

- **Goals, Activities, Bylaws, History, etc., of the CGU**
- **Membership Benefits**
- **Links to the Websites of the Hydrology and Geodesy Sections of the CGU**
- **Links to other geophysics-related websites**
- **The CGU Newsletter ELEMENTS in PDF format**
- **Information about various scientific meetings**
- **Other information related to geophysics**

*Consult the CGU website : <http://www.cgu-ugc.ca/>*

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**CGU WEB SITE ADDRESS : <http://www.cgu-ugc.ca>**

***Editor's Note:*** ELEMENTS, the newsletter for the Canadian Geophysical Union, is published and distributed to all CGU members twice each year; one Summer issue and one Winter issue. We welcome submissions from members regarding meeting announcements or summaries, awards, division news, etc. Advertisements for employment opportunities in geophysics will be included for a nominal charge (contact the Editor). Notices of post-doctoral fellowship positions available will be included free of charge.

General submissions should be sent to the Editor:

Prof. E.S. Krebs, Geology and Geophysics Dept., University of Calgary, Calgary, Alberta, Canada, T2N 1N4. Telephone: (403) 220-5028; Fax: (403) 284-0074; Email: krebes@ucalgary.ca.

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Geodesy-specific submissions should be sent to:  
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Electronic submission is encouraged.