

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

I begin this message by thanking all who participated in our Annual Scientific Meeting at the Banff Centre in May 2006. This was a joint meeting of the CGU and the Canadian Society of Soil Science (CSSS) and it was a great success. In addition to the natural scientific enrichment which occurs in such joint meetings, this year the number of registrants staying at the Banff Centre exceeded the minimum required to avoid financial penalty for unused bedrooms and charges for conference meeting rooms. Increasing costs at the Banff Centre will likely result in our meeting there, in future, only when we have a joint meeting with another society such as the CSSS. This year we returned to the outdoor barbeque format which I believe was also a great success; and will likely repeat this when we return to Banff in 2008.

Our next Annual Meeting will be held in St. John's Newfoundland from May 28 - June 1, 2007 as a joint Congress of the Canadian Meteorological and Oceanographic Society (CMOS), the Canadian Geophysical Union (CGU), three committees of the American Meteorological Society (AMS) and the Eastern Snow Conference (ESC). The three AMS Committees taking part are: Polar Meteorology and Oceanography; Climate Variability and Change; and Air-Sea Interaction. This meeting will be the first Canadian scientific meeting in many years to cover most of the fields of a typical AGU meeting. The principal difference is that with a projected one thousand registrants, this will be a considerably smaller and more intimate meeting. Because air travel to St. John's is relatively expensive, the Executive Committee has voted to double the budget for

student travel awards from a total of \$5,000 to a total of \$10,000 on a one-time-only basis for the 2007 meeting. If as successful as we hope, the 2007 joint congress may be the prelude to regularly scheduled joint CGU-CMOS meetings once every few years.

For 2008 we will be returning to Banff, but not to the Banff Centre. Rather, our meeting will be held in the Banff Park Lodge, a relatively upscale hotel and conference facility within Banff itself. While rooms will be available to conference registrants at very favourable rates, the main advantage for the CGU is that the use of, and charges for, conference facilities are not tied to guarantees of accommodation bookings. Thus our costs will be the same whether conference attendees stay at the conference hotel or elsewhere in Banff. Your Executive Committee believes this arrangement is best when the CGU meets alone or with another small society. In 2008 we will be joined by about 50 members of the Canadian Geomorphology Research Group (CGRG).

At the Annual Business Meeting, held during the Banff 2006 scientific meeting, I discussed our need to rejuvenate the Canadian National Committee of the International Union of Geodesy and Geophysics (i.e., the CNC-IUGG). The IUGG is comprised of seven (soon to be eight) international associations, namely:

International Association of Geodesy (IAG)

International Association of Geomagnetism and
Aeronomy (IAGA)

International Association of Hydrological Sciences
(IAHS)

International Association of Meteorology and Atmospheric Sciences (IAMAS)
International Association of Physical Sciences of the Oceans (IAPSO)
International Association of Seismology and Physics of the Earth's Interior (IASPEI)
International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)
[and, as of the 2007 IUGG meeting,
International Association of Cryospheric Sciences (IACS)]

The IUGG collects fees from over 80 countries and divides this revenue amongst its seven international associations. The adhering body in Canada, which pays our annual fees of about \$18,000, is the National Research Council of Canada (NRC). The NRC selects one national scientific society to act as its partner in this relationship with IUGG. Since 1994 the NRC and the CGU have had a formal partnership agreement, which was renewed in 2005 until 2010. One of the terms of this partnership agreement is that the CGU will oversee the operation of the CNC-IUGG. In addition to its relation to the IUGG, the NRC is the national adhering body to 30 other international scientific unions, each with its own CNC and partner scientific society. In total the NRC pays about \$400,000 per year in fees. As a result NRC is becoming more vigilant of the performance of all its CNC's, including the CNC-IUGG, and requires an annual report of the activities of each CNC from the relevant partner society.

The Canadian National Committee of the IUGG consists of two Canadian representatives from each of the seven International Associations, a national Chair and the president of the CGU. While our Canadian representatives attend business meetings of the various

International Associations (and have recently invited IAMAS, IAPSO and IACS to meet in Montreal in 2009) there has been little national coordination of the Canadian representatives of the seven international associations. Since the fields of interest of CGU and CMOS cover most of those of the seven international associations, the upcoming 2007 joint meeting with CMOS in St. John's will provide a forum to bring the national representatives together. The CGU Executive Committee has been discussing other means of rejuvenating the CNC on a national level including annual in-person meetings, conference calls and possibly occasional mini-IUGG meetings in Canada.

We have also discussed the possibility of a rejuvenated CNC-IUGG becoming, as a Canadian-scale version of the IUGG, the coordinated voice of the Geophysical Sciences in Canada. [This could parallel the role of the Canadian Geoscience Council (CGC) assuming, as a Canadian-scale version of the International Union of Geological Sciences (IUGS), the coordinated voice of the Geological Sciences in Canada.] At present five Canadian scientific societies cooperate in nominating members to the CNC-IUGG. These are the CGU, CMOS, CIG (Canadian Institute of Geomatics), CAP (Canadian Association of Physicists) and GAC (Geological Association of Canada). We are open to expanding and/or modifying this list and would welcome any comments or suggestions. We would also like to hear your views on any other topic related to activities, plans and strategies for the CGU. Send your comments to any member of the Executive Committee, as listed on the last page of this newsletter. Thank you for your contributions.

Gary T. Jarvis

J. Tuzo Wilson Medal – Call for Nominations

The Executive of the CGU solicits nominations for the J. Tuzo Wilson Medal – 2007. 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 and/or technological research, instrument development, industrial applications and/or teaching.

If you would like to nominate a candidate, please contact Dr. Hugh Geiger, Chair of the CGU Awards Committee, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). 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, 2007. Additional details

concerning the nomination process can be obtained from the Chair of the CGU Awards Committee.

L'exécutif de l'UGC vous invite à suggérer des candidats pour la médaille J. Tuzo Wilson – 2007. 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 Dr. Hugh Geiger, Président du Comité des Prix d'Excellence, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4

(Email: geiger@ucalgary.ca, Fax: 403-284-0074). 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, 2007. 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.

Past Wilson Medallists

1978	J. Tuzo Wilson
1979	Roy O. Lindseth
1980	Larry W. Morley
1981	George D. Garland
1982	Jack A. Jacobs
1983	D. Ian Gough
1984	Ted Irving
1985	Harold O. Seigel
1986	Michael Rochester

1987	David Strangway
1988	Ernie Kanasewich
1989	Leonard S. Collett
1990	Gordon F. West
1991	Thomas Krogh
1992	R. Don Russell
1993	Alan E. Beck
1994	Michael J. Berry
1995	Charlotte Keen
1996	Petr Vaníček
1997	Chris Beaumont
1998	Ron M. Clowes
1999	David Dunlop
2000	Don Gray
2001	Roy Hyndman
2002	Doug Smylie
2003	Garry K.C. Clarke
2004	W.R. (Dick) Peltier
2005	Ted Evans
2006	Alan Jones

CGU Young Scientist Award – Call for Nominations

The Executive of the CGU solicits nominations for the CGU Young Scientist Award – 2007. The CGU Young Scientist Awards recognize outstanding research contributions by young scientists who are members of the CGU. Both the quality and impact of research are considered. To be eligible for the award, the recipient must be within 10 years of obtaining their first Ph.D. or equivalent degree. The awards are made by the CGU Executive on the recommendations of a special committee struck for this purpose. The selection committee seeks formal written nominations from the membership, plus letters of support and a current curriculum vitae. Nominations for the CGU Young Scientist Awards may be submitted by CGU members at any time.

If you would like to nominate a candidate, please contact Dr. Hugh Geiger, Chair of the CGU Awards Committee, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). The nomination should be supported by three letters of recommendation from colleagues. Nominations should be submitted by February 28, 2007. Additional details concerning the nomination process can be obtained from the Chair of the CGU Awards Committee.

L'exécutif de l'UGC vous invite à suggérer des candidats pour le prix pour Jeune Scientifique de l'UGC – 2007. Les Prix pour Jeunes Scientifiques de l'UGC

reconnaissent les contributions exceptionnelles de jeunes scientifiques qui sont membres de l'UGC. La qualité et l'impact de la recherche sont considérés. Pour être éligible pour le prix, le scientifique doit avoir obtenu son premier Ph.D. ou degré équivalent au cours des dix dernières années. Les prix sont accordés par l'Exécutif de l'UGC sur recommandations d'un comité spécial à cette fin. Le comité de sélection sollicite des nominations formelles par écrit des membres de l'UGC, accompagnées de lettres d'appui et d'un curriculum vitae à jour. Des nominations pour les Prix pour Jeunes Scientifiques de l'UGC peuvent être soumis en tout temps par les membres de l'UGC.

Si vous désirez suggérer un candidat pour cette médaille, s.v.p. contacter Dr. Hugh Geiger, Président du Comité des Prix d'Excellence, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). Les nominations doivent être supportées de trois lettres de recommandation de collègues. Les nominations doivent être soumises avant le 28 février, 2007. 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.

Past Winners

2005	Shawn J. Marshall, J. Michael Waddington
2006	No winner

CGU Meritorious Service Award – Call for Nominations

The Executive of the CGU solicits nominations for the CGU Meritorious Service Award – 2007. The CGU Meritorious Service Award recognizes extraordinary and unselfish contributions to the operation and management of the Canadian Geophysical Union by a member of the CGU. All members of the CGU are eligible for this award, although the award is not normally given to someone who has received another major award (e.g. the J. Tuzo Wilson Medal). Nominations for the CGU Meritorious Service Award may be submitted by CGU members at any time. The award is made by the CGU Executive based on recommendations from the CGU Awards Committee, and is based on lifetime contributions to CGU activities.

If you would like to nominate a candidate, please contact Dr. Hugh Geiger, Chair of the CGU Awards Committee, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). The nomination should be supported by three letters of recommendation from colleagues. Nominations should be submitted by February 28, 2007. Additional details concerning the nomination process can be obtained from the Chair of the CGU Awards Committee.

L'exécutif de l'UGC vous invite à suggérer des candidats pour le Prix pour Service Méritoire de l'UGC – 2007. Le Prix pour Service Méritoire de l'UGC reconnaît les contributions extraordinaires et désintéressées à

l'opération et à l'administration de l'Union Géophysique Canadienne par un membre de l'UGC. Tous les membres de l'UGC sont éligibles pour ce prix, sauf que normalement, ce prix n'est pas donné à quelqu'un qui a reçu un autre prix important tel que la Médaille Tuzo Wilson. Des nominations pour le Prix pour Service Méritoire de l'UGC peuvent être soumises en tout temps par les membres de l'UGC. Le Prix est accordé par l'Exécutif de l'UGC sur recommandations du Comité des Prix de l'UGC, pour l'ensemble des contributions d'un membre aux activités de l'UGC.

Si vous désirez suggérer un candidat pour cette médaille, s.v.p. contacter Dr. Hugh Geiger, Président du Comité des Prix d'Excellence, Geology and Geophysics Dept., University of Calgary, Calgary AB, T2N 1N4 (Email: geiger@ucalgary.ca, Fax: 403-284-0074). Les nominations doivent être supportées de trois lettres de recommandation de collègues. Les nominations doivent être soumises avant le 28 février, 2007. 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.

Past Winners

2004	Ron Kurtz
2005	Ted Glenn
2006	J.A. Rod Blais

CGU 2006 ANNUAL SCIENTIFIC MEETING, 14-17 MAY, Banff, Alberta

The 32nd annual scientific meeting of the Canadian Geophysical Union took place at the Banff Centre, in Banff, Alberta, in the period 14-17 May 2006. It was held jointly with the Annual Meeting of the Canadian Society of Soil Science (CSSS). There were over 346 registered participants, of which 146 were affiliated with the CSSS. All enjoyed an excellent technical program consisting of 311 oral and poster presentations, as well as

a number of social activities (e.g., the icebreaker, barbeque, and the annual awards banquet). Notable events were the awarding of the J. Tuzo Wilson Medal to Alan Jones of the Dublin Institute of Advanced Studies and the Meritorious Service Award to Rod Blais. The citation and acceptance speeches for the Wilson Medal, and the acceptance speech for the Meritorious Service Award, can be found below.

The 2006 CGU J. Tuzo Wilson Medallist: Alan G. Jones

Citation by Jim Craven, May 17, 2006, at the Awards Banquet

Who here can remember their first day working as a summer student in geophysics or geosciences? Who here remembers how much they knew or thought they knew in second year? I can. I recall it vividly. Ron

Kurtz at the old Earth Physics Branch in 1984 had called me in to start as a summer student. I was in my second year of a Physics and Geology degree and he was very gracious, courteous and showed me around. I was very

comfortable until I met this laid back British fellow sitting with one leg over the arm of a chair; sandals, socks and shorts come to mind. He looks at me briefly and starts going on enthusiastically about how this new HP computer (state-of-the-art 32 bit processor, multi-core cpu processing, kind of like a modern Pentium but costing a few hundred thousand in 1984 dollars!). He was having difficulty communicating data from it to the VAX up in the computer room over an rs-232 line. He looked at me and said "Make it work". Basically he was asking me to get a proto-internet working. Within five or ten minutes of being with him I was entirely out of my comfort zone and I knew it would be a great place to work. Of course that fellow was Alan Jones. He had pretty much himself just started at Earth Physics too and his career was about to take off. Ron Clowes, Ian Gough and others were in the process of landing a huge program of earth science with dramatic national and international scope called Lithoprobe. The rest for Alan is history.

Alan G. Jones is now Senior Professor and Head of Geophysics at the Dublin Institute of Advanced Studies. He is acknowledged as one of the world's leading authorities on the use of natural-source electromagnetic (EM) methods - principally the magnetotelluric (MT) method - to address geoscience problems, from mining-scale targets to tectonics on the scale of cratons.

Alan began his career at the Universities of Edinburgh, Münster and Toronto during the late 70's and early 80's. Alan's strong background in physics was apparent as he actively published in a number of areas related to signal processing and the inversion of MT data. Early papers on the "classification of lower crustal layers" and the "problem of 'current-channelling'" remain authoritative reviews of key aspects of MT even today. His 1984 paper on the "equivalence of the 'Niblett' and 'Bostick' transformations" was included as part of a Society of Exploration Geophysics Reprint Series devoted to seminal papers on MT.

With over a hundred publications in refereed journals he has already made a prolific contribution to both Canadian and international geophysics. His publications span a broad range of sub-disciplines of electromagnetic geophysics. Topics include geomagnetic source-field effects, spectral analysis methods, MT impedance estimation and decomposition, modelling/inversion methods, and geological interpretation. He has published on the application of electromagnetic studies to different targets in a variety of different environments. He has done field-work in virtually all of the provinces and territories of Canada as well as in many other countries. In addition to the

coverage they provide in the field of electromagnetic geophysics, Alan's publications build important bridges with other disciplines including geomagnetism, seismology, tectonics, continental crustal evolution, mineral exploration, time-series analysis, and geophysical instrumentation. The publications have included important tutorial-types papers, leading edge contributions on new ideas and methods, and detailed data analysis/interpretation papers.

Alan's research in the field of electromagnetics is innovative and world-leading. For example, he is the lead developer of a computer code for removing 3D galvanic distortions for multiple sites and multiple frequencies, a code that is widely used by others in the EM induction community. For MT research in the remote Slave craton of northern Canada, he designed a novel experimental installation that enabled new data to be recorded along a 600-km-long ice road, including the deployment of ocean-bottom EM instruments in lakes - a unique undertaking. He has organized and led industry consortiums to address important problems in exploration-related EM studies. He has developed new long-period MT systems and assisted with the transfer of this technology to the private sector. All of these activities have led to publications and new insights into the value of the electromagnetic method and the tectonics or related aspects of the regions in which the research has been undertaken.

Dr. Jones' most important contributions originate from his integrated interpretations of electromagnetic and other data. He has contributed to major advances in our understanding of continental-scale geological structures, including the Canadian Cordillera, Trans-Hudson Orogen, Slave craton, Himalayas, Appalachians, and Scandinavian craton, and has provided fresh insights into the general nature of the lower continental crust and upper mantle. He is widely acknowledged as the key scientist in the contributions of MT surveys and their interpretation to LITHOPROBE transect studies. He is one of only a handful of specialists capable of relating the results of electromagnetic surveys to other geoscience data sets, and is often asked to represent the electromagnetic community at international multidisciplinary meetings and workshops.

It is interesting to note that some of J. Tuzo Wilson's most important contributions concerned the structure and tectonics of continental-scale features. He would have been fascinated with the discoveries that have resulted from the research of Alan Jones. Alan is a rock solid choice for the Tuzo Award.

Acceptance by Alan Jones

Mr. President, esteemed colleagues and guests, and my wife Elke,

Thank you Jim for those words. I am truly humbled beyond belief. For once in my life, I am speechless almost..... I look at the list of previous recipients, and I hold them all in awe.

I received the email from Gary of my award at midnight as I was going to bed in Dublin. After reading and re-reading it many times, and checking that it wasn't dated April 1st, I was unable to sleep and spent the rest of the night in a daze. Thanks Gary.

This award is by far the most significant recognition in my scientific career of the contributions that I have made. However, if I may be allowed to paraphrase Sir Isaac Newton, *if I have been successful in my career, it is because I have stood on the shoulders of Canadian giants*. Time does not permit me to recount all of the interactions I have had with many, many excellent and generous Canadian scientists over the 23 years that I worked in Canada at UofT, then the Earth Physics Branch/Geological Survey of Canada, but I would like to identify some of those Canadian giants who influenced my career, many of whom were similarly recognized by receiving the Tuzo Wilson medal.

My personal connection to Tuzo is unfortunately slight. I met Tuzo on only a few occasions, but was always thrilled by his vision. Whilst at UofT, I was in Tuzo Wilson's office, an office I shared with Gary Jarvis, your President. And I note that Tuzo was a Green Scholar at Scripps in 1980, as was I in 1987.

I began my career in EM induction in 1973 at the University of Edinburgh by deploying, in Scotland, Gough-Reitzel magnetometers borrowed by my supervisor, Rosemary Hutton, from Ian Gough – a very deserving recipient of the Tuzo Wilson Medal in 1983. On Ian's invitation, I came to Edmonton for two months in 1974 to hand-digitize the data – arriving in mid-March to be greeted by minus 30C temperatures and swearing never to come back to this frozen land again! Ian made me welcome at UofA, and whilst there made the acquaintance of the two other Canadian induction greats – David Rankin and Walter Jones – and also UVic's John Weaver who came for a visit. The sparks really did fly at UofA in those days.

On the way back to Edinburgh, I stopped off in Toronto for a few days and met the members of the other Canadian citadel of EM induction – Nigel Edwards, Dick Bailey, Gordon West, and George Garland. Gordon's book with Fraser Grant was then, and is now, the bible of EM theory.

At the end of my PhD I was offered a 2-year postdoc fellowship by Nigel Edwards and – after a 4-year sojourn in Germany – took up that offer in 1982 where I was

funded both by Nigel and George Garland, another Wilson medallist (1981). Nigel is being recognized this year by being awarded the SEG's Gerry Hohmann Award – a very worthy recipient indeed. And of George I can only say that I held him in awe. There was nobody who came to UofT, no matter how esteemed, to give a seminar who wasn't humbled by his incisive questions. At UofT for 2 years I had many wonderful lunchtime discussions with Nigel, George, Gordon – medallist of 1990 – Dick and Chris Chapman. I also knew the medallist from 2004, Dick Peltier, who took me to a hospital as I writhed in agony after twisting my knee out playing squash with him – after he won the point that is.

In late 1982 I was asked to come to Ottawa for an interview by Mike Berry, medallist of 1994, and Alan Green – more about Alan later. Alan offered me a position at the Earth Physics Branch, which I accepted but was only able to take up in 1984 due to immigration issues. Once at the Earth Physics Branch, I quickly became aware of the fledgling Lithoprobe program, and – although initially reluctant – Lithoprobe has guided my career since 1987 and, I believe, is the direct basis why you consider I should be the 2006 recipient.

Many Lithoprobe activists, especially those who were responsible for its initiation, have been recognized by receiving this award – Ted Irving (1984), Ernie Kanasevich (1988), Charlotte Keen (1995), Chris Beaumont (1997), Roy Hyndman (2001), and, of course, Ron Clowes (1998). Those visionaries of the early 1980s launched a geoscience programme that became the envy of the world. A programme that is still revered across the globe as the way that science – not just geoscience but science in general – should be organized. A programme that has had an immense impact on many careers, especially my own.

Tuzo Wilson embraced fully the thoughts of Sir Isaac Newton, who stated “*We build too many walls and not enough bridges.*” Tuzo built bridges, and bridge-building between the geoscience disciplines was the guiding principle, and lasting legacy, of the Lithoprobe programme.

I would like to make a very special mention of the role that Alan Green has played in my career. As I said, Alan offered me the Earth Physics Branch position in late 1982, mid-September to be exact, and although I eventually took it, I must apologize to him for having said *No* when he asked me at the interview if I was interested in the job. Those were very heady days in the mid- and late-1980s – we were doing groundbreaking work – and I consider myself extremely fortunate to have been involved and to be able to interact on a daily basis with the trio of Alan Green, Carl Spencer, and Berndt Milkereit. Alan was the one who constantly pushed me to explain EM to especially geologists, and not to stop at the

resistivity model but to consider its geological and tectonic implications. Alan engineered the invitation to me to present the “*MT and reflection: an essential combination*” paper at the 1986 BIRPS seismic reflection workshop, which launched that aspect of my career. Alan’s contributions to lithospheric understanding were acknowledged last year with him receiving the Stephan Muller Medal of the European Geosciences Union, and I do think that he is an unsung Canadian great. But I must be honest with you, it is Alan Green who invited and encouraged me to apply for the position I now have in Dublin, so is responsible for me leaving Canada.

By one significant yardstick though, we EM specialists have failed Canadian geophysics. That measure is that electromagnetism in Canada is now far, far, poorer than when I first arrived. In the early 1980s there were no less than 10 university faculty, and 8 research and support scientists at the Earth Physics Branch, undertaking electromagnetic studies at crustal and mantle scale, both marine and on land, covering everything from instrumentation development to theory to scale modelling to numerical modelling to field studies. Today, as I speak there are 4 university faculty and 1 scientist at the GSC doing such EM work. Notwithstanding the absolutely unparalleled support for EM given by the Lithoprobe program, the numbers

undertaking EM studies in Canada have gone from 18 to 5 within one generation. And this is in a country that has been leading the world for over half a century in electromagnetic geophysics. Over the years and in many institutions Canadian universities have consistently chosen to hire those in fields other than EM, and at a time when EM is contributing so much to knowledge and society. We have failed to convince you, my colleagues, of the need for a strong EM capacity within Canada, and I hope that this is addressed in the future.

Finally, I remind you of one of Tuzo’s famous quotes - *I enjoy, and always have enjoyed, disturbing scientists*. Those of you who’ve had the wonderful benefit, as I had, of attending Lithoprobe transect meetings over the years know that I embrace and subscribe fully to that sentiment of Tuzo’s. Perhaps some of you were disturbed a little over the years by my criticisms, but it was all in the name of stretching each other.

I would like to finish by again thanking those who supported my nomination, especially Jim Craven, and the CGU for honouring me in this way. Everything I have accomplished in Canada has been made possible because of the gift that the Canadian landmass offers the inquiring mind, the vision of those in the early 1980s, and the generosity of Canadian geophysicists, and I salute you all.



Left: John Pomeroy, CGU-VP (left) presenting the Tuzo Wilson Medal to Alan Jones.
Right: Rod Blais, making his acceptance speech, after being awarded the Meritorious Service Award

The 2006 CGU Meritorious Service Award Winner: J.A. Rod Blais

Acceptance Speech by Rod Blais

Thank you most sincerely for this Award which is normally given for lifetime achievements... It has been a real privilege for me to work with the CGU executives, leading geophysicists and other Earth scientists in Canada

and abroad. I have learned much over the years and it has been very enjoyable and rewarding.

The organization of CGU Annual Meetings since 1991 would not have been possible without the

contributions of a very dedicated team of helpers, starting with M.A. Stroh of the University of Calgary Conference and Special Event Services, and more recently, Conference Concepts, along with her support staff over those sixteen years. Over the past decade or so, Drs. P. Wu and E. Krebs have contributed much to the website and the technical programs, respectively. Recently, Drs.

H. Geiger and M. Soofi have also helped greatly over a number of years. Numerous graduate students have contributed in various ways toward the success of those annual meetings. Thanks to all of them!

Finally, I am looking forward to the CMOS-CGU-AMS meeting next year in St. John's Newfoundland, and I hope to see you all there! Thanks again for the Award!

The POLARIS Session at the CGU 2006 Meeting

Convenor: Ian Ferguson, University of Manitoba

Session Chairs: Fiona Darbyshire, University of Western Ontario / Geological Survey of Canada; Kristy Tiampo, University of Western Ontario

The POLARIS session took place on the first morning of the CGU 2006 meeting, and gave a wide cross-section of presentations on seismicity, lithospheric structure, seismic and electrical anisotropy, and new analysis methods. Studies related to the Ontario arrays dominated the session; however other regions of Canada were also represented, and the analyses probed a variety of depths within the Earth from the near-surface to the outer core. Undergraduate and graduate students were well represented in the session, with 3 presentations given by students and many more with student co-authors.

Perhaps the most prevalent theme of the session was the way in which the POLARIS networks have advanced the understanding of Canadian seismicity, tectonics and Earth structure. The high data quality is ideal for the exploration of existing and new analysis methods (e.g. Pinnegar & Eaton, Bentham & Eaton). Detection and characterisation of seismicity is significantly improved by the inclusion of POLARIS station data (e.g. Wagstaffe et al., Ma & Eaton, Sonley et al., Dineva et al.). The POLARIS seismic and magnetotelluric networks in Ontario allow studies of the crust and upper mantle in an unprecedented level of detail (e.g. Darbyshire & Lebedev, Ferguson et al., Frederiksen et al., Zhang & Frederiksen), and the combination of new information on

seismotectonics and earth structure leads to new ideas about the evolution of the region (e.g. Eaton). Dense seismic networks such as the southern Ontario POLARIS stations also have significant importance in global studies of deep earth structure (e.g. Alexandrakis & Eaton).

Johanna Wagstaffe (UWO) was presented with the Chevron Canada Outstanding Student Paper in Seismology prize at the CGU Awards Banquet, and Caterina Alexandrakis (UWO) was presented with the Shell Canada Best Student Poster Award.

A POLARIS meeting was held the following afternoon. The first section of the meeting was open to anyone who was interested, and consisted of a brief update on current POLARIS deployments, and discussion of potential future collaborations. The possibilities of a future deployment in Labrador was raised by researchers from Memorial University, Newfoundland, and Alan Jones of DIAS expressed an interest in bringing a POLARIS collaboration into the PICASSO seismic/MT experiment planned for Spain and northern Africa. The second section of the meeting was a discussion between David Eaton, Andrew Frederiksen, Ian Ferguson and Fiona Darbyshire, centred around results and interpretation of mantle models for the Superior Province in Ontario, produced primarily through analysis of data from POLARIS/FedNor seismograph stations. The idea of producing a set of synthesis papers in a major Canadian or international journal was broached. Discussion then shifted to the upcoming HuBLE (Hudson Bay) project and logistics for 2006 seismograph station deployments.



HYDROLOGY SECTION NEWS

Hydrology Section Committee Reports

Compiled by Dirk de Boer, University of Saskatchewan (deboer@duke.usask.ca)

Canadian National Committee for the International Association of Hydrological Science (CNC-IAHS)

Position	Representative	email address
Senior Representative and Chair	John Pomeroy, Univ of Saskatchewan	pomeroy@usask.ca
Junior Representative and Secretary	Dan Moore, UBC	rdmoore@geog.ubc.ca
President, CGU-HS	Lawrence Martz, Univ of Saskatchewan	lawrence.martz@usask.ca
Vice-President, CGU-HS	Jim Buttle, Trent University	jbuttle@trentu.ca
President, CMOS	Susan Woodbury	president@cmos.ca
Delegated by President, CWRA	Al Pietroniro, NWRI	al.pietroniro@ec.gc.ca
Delegated by President, CNC-IAH	Garth van der Kamp, NWRI	garth.vanderkamp@ec.gc.ca
Member-at-large, CGU-HS	Bill Quinton, Wilfred Laurier University	wquinton@wlu.ca

IAHS Commission Representatives

The Canadian National Representatives to IAHS Commissions and to UCCS are:

Commission	Representative	email address
International Commission on Surface Water	Don Burn, Univ Waterloo	dhburn@uwaterloo.ca
International Commission on Groundwater	Jim Hendry, Univ Saskatchewan	jim.hendry@usask.ca
International Commission on Water Quality	Miriam Diamond, Univ Toronto	diamond@geog.utoronto.ca
International Commission on Continental Erosion	Dirk de Boer, Univ Saskatchewan	deboer@duke.usask.ca
International Commission on Coupled Land-Atmosphere Systems	Wayne Rouse, McMaster Univ	rouse@mcmaster.ca
International Commission on Remote Sensing	Al Pietroniro, NWRI	al.pietroniro@ec.gc.ca
IUGG Commission on Cryospheric Science	Mike Demuth, GSC	mdemuth@NRCan.gc.ca
International Commission on Water Resources Systems.	Vacant	
International Commission for Snow and Ice Hydrology	Vacant	

Activities, June 2005 to May 2006

- IUGG 2007 in Perugia, Italy**

Canadians are convening 2 symposia and co-convening 6 symposia for the IAHS component of the IUGG General Assembly in Perugia in 2007. This is excellent representation and international leadership on behalf of Canada. There is an upcoming IAHS Bureau meeting in Paris in July

where the details of the Perugia meeting will be decided; 3 of the 9 commission presidents are Canadian, so we will have a strong voice in this. Perugia information can be found at: www.IAHS.inf

- Hydrological Sciences Journal and back issues are now online - see the IAHS website www.iahs.inf
- Pomeroy along with 4 other members of the IAHS Bureau was part of the IAHS 'Tison Jury'

to select the winner of the Tison Prize. No Canadians were nominated.

- No Canadians were nominated for the International Hydrology Prize, nor did Canada support any candidate
- Items Arising from the Last Meeting of CNC-IAHS

Action: John Pomeroy to send a letter to the CGU-HS President with a request that he approach CGU with a proposal to create a CNC-IACS housed within CGU. The current UCCS representative to be informed of this proposal.

Response: As the creation of IACS is pending until a vote in Perugia in 2007, it was felt that the creation of a CNC-IACS was premature and that CNC-IAHS would cover the Commission on Cryospheric Sciences through the system of national correspondents until the new arrangements for IACS are finalized.

Action: CNC-IAHS to solicit for a national representative to ICSIH as part of its national representative renewal.

Response: Pomeroy has discussed this with Dr. Sean Carey of Carleton University who would be willing to take on the role of national correspondent to ICSIH.

Action: Revise the Terms of Reference for National Representatives to IAHS Commissions to include as formal duties the attendance at the IUGG General Assembly and participation in voting, as well as overseeing the production of the quadrennial reports. Appointments are for 4 years and are made during the year of the IAHS Scientific Assembly.

Response: The Terms of Reference have been revised and will be voted upon by CGU-HS in its upcoming AGM

Action: The Chair of CNC-IAHS (John Pomeroy) to contact the Presidents of CGU-HS and CWRA-CSHS to encourage greater interaction between these organizations and to promote their common interest in developing Canadian hydrology.

Response: This has been done and there is great good will between these organizations and a desire to meet; however, a common meeting place and time for CGU and CWRA has not yet been identified.

Action: The Chair of CNC-IAHS (John Pomeroy) to contact (i) the National Research Council expressing the interest of CNC-IAHS in being involved in CNC-IHP; and (ii) Academy of Science to discuss a Canadian Hydrology Programme

Response: Contact was made with NRC and the Chair of the CNC-IHP. CNC-IHP is reorganizing itself and communicated in the fall that it hopes to have better communication with CNC-IAHS. There has been no further dialogue from CNC-IHP with CNC-IAHS of a pan-Canadian position for the IHP meeting in Paris in July 2006, however. The inclusion of Quebec at UNESCO activities may result in further changes to Canadian representation at IHP. The Academy of Science initiative was led from the prime minister's office and with a change of government its current status is unknown but there is no official office to contact yet.

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

Chair: Christopher Spence, Environment Canada, Saskatoon, SK S7N 3H5, chris.spence@ec.gc.ca

Vice Chair: Paul Whitfield, Environment Canada, Vancouver, BC V6C 3S5, paul.whitfield@ec.gc.ca

CWRA Members at Large: Taha Ouarda, Institut national de la recherche scientifique, Québec, QC G1K 9A9 taha_ouarda@ete.inrs.ca

Al Pietroniro, Environment Canada, Saskatoon, SK S7N 3H5 al.pietroniro@ec.gc.ca

CGU-HS Members at Large: John Pomeroy, University of Saskatchewan, Saskatoon, SK S7N 5A5 pomeroy@usask.ca (CGU-HS)

Robert Metcalfe, Watershed Science Centre, Trent University, Peterborough, ON K9J 7B8 rmetcalfe@trentu.ca (CGU-HS)

Objective and Roles

The objective of CNC-PUB is to coordinate and communicate IAHS's PUB 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

At the 2005 annual general meetings of the CGU-HS and CSHS, it was proposed and accepted in principle that a Canadian National PUB Committee (CNC-PUB) be established as a joint committee of the CGU-HS and CSHS with the objective of coordinating and communicating the PUB program in Canada. In response, terms of reference (attached) were written and a membership with a chair, vice chair, and four members at large; two each representing the CGU-HS and CSHS. A national working group proposal was submitted to the PUB scientific steering group and accepted in February, 2006.

To ensure a defined reporting structure from CNC-PUB to IAHS from CNC-PUB the CNC-IAHS senior representative has suggested that the chair of CNC-PUB could be delegated as a national correspondent for CNC-IAHS to the International Union of Geodesy and Geophysics. This would require a change in the terms of reference to CNC-IAHS to include CNC-PUB as an active component of CNC-IAHS.

The proceedings of a workshop on prediction in ungauged basins in cold regions were published by the Canadian Water Resources Association in April 2005. Individual chapters are available free on line at: http://www.cwra.org/Publications/CWRA_-_Bookstore/PUB_Workshop/pub_workshop.html and the book is available at the same site for a cost of \$15. The cold regions workshop in Yellowknife was followed by a mountainous regions workshop entitled "Hydrology for the Orographically Challenged" on November 28-30, 2005 at Manning Park, British Columbia. It was hosted by the British Columbia Branch of the Canadian Water Resources Association. A commentary paper detailing results and recommendations is in press in the Canadian Water Resources Journal. Presentations from the meeting are available at: <http://scitech.pyr.ec.gc.ca/waterweb/pub/>.

Future Meetings and Activities

There are several fronts proceeding in one way or another. The PUB scientific steering group is interested in a cold regions working group, possibly lead by Canadians. The cold regions PUB workshop in Yellowknife highlighted the desire for a group such as this. The community linkages presently exist with CFCAS funding approved for the Improved Processes, Parameterization and Prediction (IP3) research group. A formal cold regions working group will be proposed shortly to the PUB SSG.

A second Canadian led working group may be established in response to the mountainous regions PUB workshop in Manning Park meeting. This 2010 hydrology working group has a goal to improve hydrological prediction in ungauged mountainous basins using enhanced climate observation network and enhanced resolution modeling. There is the possibility to pursue a NSERC network strategic grant. Linkages made with PUB would likely only assist in garnering research funds.

There is considerable effort going on in Ontario to improve mechanisms for prediction of streamflow regimes in that province, including expanding the hydrometric and network, and network planning evaluation. A workshop in Ontario may be in order to make linkages with the PUB initiative and the issues in Ontario.

The PUB initiative needs to become more visible in the Canadian water resource community. The Yellowknife and Manning Park workshops and their subsequent or upcoming publications have been successes. Efforts will be made to get commitments for special PUB sessions at the 2007 CWRA and CGU annual meetings.

CGU-HS Northern Research Basins Committee

Chair and Canadian Chief Delegate: Kathy L. Young, Geography Department, York University

One of the main activities of the CGU-HS Northern Research Basins Committee during the last year was Canadian participation in the 15th NRB Symposium and Workshop held in Luleå and Kvikkjokk, Northern Sweden from Aug. 29-Sept. 2, 2005. The general theme of the 15th meeting was "linkages between human activities and high latitude hydrological systems". As outlined in the NRB Mandate and the Canadian NRB terms of Reference, the Canadian participation in the NRB is limited to 10 delegates appointed by the Canadian Chief Delegate (and approved by the CGU-HS Executive) to represent Canadian interest in the hydrology of northern areas. The Canadian Chief Delegate to the 15th meeting was Philip Marsh and Kathy Young was the

Deputy Chief Delegate. Kathy has now taken over the position of Chief Delegate and Philip Marsh is acting Deputy Chief Delegate.

Six Canadian hydrologists attended the meeting, though 10 delegates were originally invited. Canadian delegates are invited based on past experience and in order to represent various aspects of Canadian northern hydrology. Attendees and area of expertise include: Hok Woo (permafrost hydrology), Murray Mackay (regional climate modelling and large scale water fluxes), Kathy Young (high arctic), Ric Janowicz (operational water resources and the Wolf Creek research watershed), Chris Spence (subarctic hydrology and hydropower applications), Philip Marsh (cold regions hydrology and Mackenzie Valley). Although only 10 Canadian delegates may attend, other Canadians were notified that they could apply to attend though attendance is dependent on available space at the discretion of the local organizers.

Other attendees of the 15th NRB included representatives of the eight member countries which include Canada, Denmark/Greenland, Finland, Iceland, Norway, Russia, Sweden and USA. In addition to science presentations, there were reports from two NRB task forces. These include (1) comparison of basin water balance from a range of circumpolar environments (Doug Kane, USA) and (2) climate change and lake thermal regime in northern environments (Nikolai Filatov, Russia). The basin water balance task force is now completed and a new task force has been approved (PUB-prediction in ungauged basins). Chris Spence (Canada) is heading up that task force and will report at the 16th NRB meeting, Karelia, Russia in August, 2007. As in past years, the meeting resulted in a published proceedings of the meeting and several papers were also submitted for consideration for publication in a special issue of the journal, *Nordic Hydrology*.

Canada will be hosting the 17th NRB meeting in late August, 2009. Plans are to hold the symposium/workshop on an expedition ship which will travel from Ungava Bay (northern Quebec) to Baffin Island. The theme of the conference will be "hydrologic achievements and advances during the international polar year (IPY)". An organizing committee has been formed and fund-raising has commenced.

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 is Secretary to IAHS-International Commission on Continental Erosion Secretary and also ICCE Canadian Delegate

Objectives

The objectives of the Erosion and Sedimentation Committee are 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, with some aspects of Water Quality – through

- 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

- 1 Continued representation at CGU-HS meetings. No organized sessions at 2006 Annual Conference but several papers on topics related to E&S activities were presented. Preliminary discussion has taken place for special session at 2007 CGU.
- 2 Reciprocal membership arrangement and affiliation between CGU and Canadian Geomorphology Research Group have been approved by CGRG membership. Earliest date for CGRG to hold its annual meeting at CGU is 2008.
- 3 University of Dundee is hosting ICCE International Symposium on Sediment dynamics and the hydromorphology of fluvial systems, 3-7 July 2006.
http://www.dundee.ac.uk/geography/news_events/IAHS2006/third_circular.pdf
- 4 Dirk De Boer is co-convenor of Symposium at IUGG-IAHS 2007 - "Water Quality and Sediment Behaviour of the Future: Predictions for the 21st Century" (Sponsor ICWQ, ICCE, ICGW, PUB and ICT).

Committee on Isotopic Tracers including Canadian Network of Isotopes in Precipitation subcommittee

Chair: Jean Birks, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, N2L 3G1, email: sjbirks@scimail.uwaterloo.ca

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 proposed 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
- recommend nominations to the Canadian National Committee for IAHS (International Association of Hydrological Sciences) for a Canadian Correspondent for the IAHS Committee on Tracers

2005 Activities and Progress Towards Objectives:

Significant progress has been made towards promoting the understanding and application of isotopic tracer techniques in hydrology and related sciences in 2005. A milestone for the committee was the publication of "Progress in Isotope Tracer Hydrology in Canada" in Hydrological Processes (Gibson et al., 2005).

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** where 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,
- and **Fort McMurray** where isotope tracers are being used to do regional water balances to evaluate lake sensitivity to atmospheric deposition as part of the Cumulative Environmental Management Association Acid Sensitive Lakes Program.

International research activities:

Members of the committee have been active in national and international research activities. Former Chair of the Committee, John Gibson, had a one-year secondment the Australian Nuclear Science and Technology Organisation (Sydney Australia) where he served as a senior visiting scientist with their hydrology group.

The Canadian Network for Isotopes in Precipitation (CNIP) research has continued to directly support international efforts such as the International Atomic Energy Agency's (IAEA) Global Network for Isotopes in Precipitation. Two new stations were added to the network in 2005, and a manuscript is currently in preparation describing the first 7 years of analysis.

One emerging avenue of international research is the integration of stable isotopes of water into ocean, atmosphere, and land-surface hydrological models. These

models provide capability for tracking the isotopic composition of reservoirs and fluxes, and model evaluation and for examining the underlying causes of water-cycle variability. To date, isotopes are operationally implemented in several global climate models (e.g. ECHAM-4, GISS, FORSGC AGCM), and new regional climate models with isotope capability are also under development (e.g. REMOiso). The CNIP dataset is the most comprehensive high-latitude precipitation datasets available and continues to be a key validation tool for isotope equipped GCMs and RCMs. In 2005 funding was obtained from the France-Canada Research Foundation (FFCR) to strengthen ties between isotopic GCM and RCM modellers and Canadian hydrologists using water isotope tracers (T.W.D. Edwards and G. Hoffmann).

Dissemination

Tracer Committee members have been actively promoting the use of isotope tracer techniques in hydrology through refereed publications, meetings, conferences as well as supporting the training of highly qualified persons. We are particularly pleased with the number of high quality presentations describing the use of water isotope tracers at the CGU Hydrology Section Student Conference held at Wilfrid Laurier (Dec. 2005). We are currently planning a session to focus and highlight recent advances by Canadian researchers for the 2007 CGU general meeting.

Key Reference: Gibson J. J., Edwards T. W. D., Birks S. J., St. Amour N. A., Buhay W. M., McEachern P., Wolfe B. B., and Peters D. L. (2005) Progress in isotope tracer hydrology in Canada. *Hydrological Processes* **19**, 303-327.

Glaciers and Environment Committee

Chair: Prof. D. Scott Munro, Department of Geography, University of Toronto at Mississauga, Mississauga, ON, L5L 1C6 CANADA, smunro@eratos.erin.utoronto.ca.

Vice-Chair: Michael N. Demuth, P. Eng., Geological Survey of Canada;

Advisory Members: Prof. Gwenn E. Flowers, Simon Fraser University; Dr. Roy M. Koerner, Geological Survey of Canada; Prof. Shawn Marshall, University of Calgary; Prof. Brian Menounos, University of Northern British Columbia; Prof. John W. Pomeroy, University of Saskatchewan; Jeffrey Schmok, P. Geo., Golder Associates Ltd.; Prof. Martin J. Sharp, University of Alberta.

Mandate and Objectives

- a. Assist the CGU and its executive in promoting glaciological research that is relevant to hydrological and environmental problems.
- b. Provide CGU members with information about glaciological research activity, as well as identify opportunities for collaboration among individuals and groups.
- c. Provide CGU members with information about the scope and extent of glaciological data, and promote efforts to improve accessibility to such data.
- d. Influence research development by establishing lines of communication with other working groups in snow and ice, such as the Cryospheric System (CRYSYS) to monitor global change in Canada and identify personnel training opportunities.
- e. Identify and promote opportunities for educating other members of the scientific community and the general public about glaciers and their role in the environment.

Meetings and Activities

a. Michael Demuth and Roy Koerner continue to build the National Glaciology Program (NGP) in the Geological Survey of Canada (GSC), supported by Natural Resources Canada, Environment Canada and University partners, consolidating research in Arctic and Western Canada.

b. Michael Demuth continues as Canadian Correspondent to the International Glaciological Society, and Canadian National Representative to the International Commission on Snow and Ice.

c. Martin Sharp and Scott Munro attended the *CRYSYS Final Annual Science Meeting*, Toronto, Ontario, March 2006; in a session focused on the International Polar Year (IPY), Martin gave a presentation on *GLACIODYN – The dynamic response of Arctic glaciers to global warming*, and was a key member of an invited panel discussion : *IPY and beyond – priorities and opportunities for future cryosphere and climate research*.

Progress on Issues and Objectives

The NGP work, in partnership with others, is central to the objectives of this committee where progress occurs through continued development of the AWS program at the Peyto, the Place and the Ram River Glaciers, as well as through work in the Canadian Arctic. However, Canadian glacier research is now entering a new phase, with the completion of the CRYSYS program and the funding of two new cryosphere research initiatives: *Improved Processes and Parameterization for Prediction in Cold Regions* (IP3; J.W. Pomeroy, P.I.) and *Western*

Canadian Cryospheric Network (WC2N; R. Menounos, P.I.). This signifies expanded opportunities for interaction among cryospheric scientists in Canada. To this end, committee membership has been expanded to nine members, including the Principal Investigators for the new projects (Menounos and Pomeroy). The committee size is now well beyond the original CGU-HS mandate of five members, but this is considered to be necessary if we are to move ahead in the months and years to come.

Future Meetings and Activities

Progress toward a collaborative Canadian glacier network, a need identified in the GSC Workshop (Ottawa, 2000) and promoted through successive CRYSYS meetings, is expected to take on new life with the advent of IP3 and WC2N. Continued participation of the Canadian glacier research community in the CGU Annual Meeting is vital in this regard, so the Committee will look toward organizing special sessions on glaciological research at this, and other meetings, that provide opportunities to communicate the research efforts of our community. Regarding the future in this regard, we look with interest toward an upcoming meeting of the International Association for Cryospheric Sciences (formerly the International Commission on Snow and Ice), which will meet in Montreal, 2009.

Other Business

The glacier inventory is a continuing matter of concern, particularly as it relates to water resource changes in Western Canada; as is continued development of new research personnel. As noted at the final CRYSYS meeting, there is an urgent need to deal with issues related to archiving and sharing of data resources, a matter that could involve the Committee at some future date.

Committee on Snow

Chair: Professor John Pomeroy, Centre for Hydrology, Dept of Geography, 117 Science Place, University of Saskatchewan, Saskatoon S7N 5C8. pomeroy@usask.ca

Secretary-Treasurer: Michael Demuth, National Glaciology Programme, Geological Survey of Canada, Natural Resources Canada, Ottawa;

Mandate and Objectives

The goal of the CSC is to promote the advancement of snow science in Canada, by:

- 1) improving the visibility of Canadian snow specialists in national and international programmes,
- 2) fostering communication, professional development

- and collaboration amongst snow scientists,
- 3) receiving and disseminating information from international snow and ice organisations and related fields,
- 4) reporting Canadian snow science achievements to the National Correspondents of the IUGG Commission on Cryospheric Science (CCS), the IAHS International Commission on Snow and Ice Hydrology (ICSIH) and other organisations such as International Glaciological Society (IGS).

Meetings and Activities

In the last year the CSC promoted and participated in the *Eastern Snow Conference* which was held in Waterloo, Ontario in June 2005. Dr. Barry Goodison of MSC gave a keynote address on the International Polar Year. There was excellent Canadian participation with 18 papers published by Canadians in the *Proceedings of the 62nd Eastern Snow Conference* and 11 papers by Canadians published in a Special Issue of *Hydrological Processes* that was edited by Pomeroy and devoted to the snow conferences (*Hydrological Processes*, Volume 20, issue 14). Mr. Warren Helgason of the University of Saskatchewan won the Campbell Scientific Medal for the best student paper where instrumentation plays a key role.

The CSC also hosted a snow session at the *Canadian Geophysical Union* meeting in Banff, where 5 papers were presented and Dr. Danny Marks of the USDA was the invited speaker. Snow papers (3) were also given in the Mackenzie GEWEX Study (MAGS) special session and there was a large snow content in the President's Plenary lecture given by Dr. Hok Woo of McMaster University and PI of MAGS.

Progress on Issues and Objectives

- a. Gerry Jones, Univ. du Quebec, Sainte-Foy, successfully effected the transformation of the old IAHS International Commission on Snow and Ice (ICSI) into the new IUGG Union Commission on Cryospheric Sciences (UCCS) and retired as President, becoming the first past president and founder of UCCS. UCCS has a new website <http://www.glaciology.su.se/ICSI/>.
- b. The International Commission for Snow and Ice Hydrology was formed in Brazil in 2005 at the instigation of Canada and invitation of IAHS and its first executive bureau includes 2 Canadians, John Pomeroy as President and Phil Marsh (Env. Canada) as Vice President. As ICSIH is a successor organization to ICSI, Gerry Jones is ICSIH's first honorary president. The ICSIH Bureau held its first meeting in Paraguay in 2005 and has a new website <http://www.geo.su.se/ICSIH>.

- c. Michael Demuth, GSC, Ottawa is National Correspondent to the new Union Commission on Cryospheric Sciences and National Correspondent to the International Glaciological Society and serves as a liaison between these organisations and the CSC.
- d. Sean Carey, Carleton University, Ottawa is the National Correspondent to the new International Commission on Snow and Ice Hydrology.
- e. Dr. Marsh is convening a polar hydrology symposium and Dr. Pomeroy is co-convening a snow-vegetation interactions symposium at the IUGG in Perugia, Italy in 2007. Dr. Pomeroy was a member of the IAHS committee that designed the Perugia scientific programme.
- f. Two research networks that will deal with snow research have been funded by the Canadian Foundation for Climate and Atmospheric Sciences www.cfcas.org. WC2N is the Western Canadian Cryospheric Network and IP3 is the Improved Processes and Parameterisation for Prediction in Cold Regions. These Networks should do much to promote snow research in Canada.

Future Meetings and Activities

The CSC will continue to promote Canadian snow researchers to be involved in the CGU and international snow hydrology and cryospheric meetings and to present at the annual meeting of CGU. A snow session is planned for 2006. The CSC works to enhance the role of the ESC and WSC in Canada. The Eastern Snow Conference has been invited to meet with CGU and CMOS in 2007 in St John's, Newfoundland and this should be a strong snow science meeting.

Committee on River Ice Processes and the Environment

Chair: David Andres, P.Eng., Northwest Hydraulic Consultants Ltd., Edmonton
 Telephone: 780.436.5868; Fax: 780.436.1645;
 Email: dandres@nhc-edm.com

Secretary: Brian Morse, Université Laval, Quebec

Treasurer: Kersi Davar (retired), University of New Brunswick

Members: Terry Prowse, Martin Jasek, Faye Hicks, David Milburn, Rick Carson, Terry Miles, Jay Doering, Spyros Beltaos, Raymond Bourdages, Brian Burrell, Steve Daly, Chandra Mahabir.

Mandate and Objectives:

- (1) Identify specific high-priority topics for research and development and promote the undertaking of relevant research programs;

- (2) Facilitate information dissemination and exchange of ideas among practitioners, researchers, and resource managers; and
- (3) Encourage the incorporation of pertinent lectures or courses in undergraduate and graduate studies at Canadian Colleges and Universities.

Meeting and Activities:

13th Workshop, Mount Ascutney, Vermont, 2005.

The 13th Workshop was held at the Mount Ascutney Resort, Vermont on September 15 and 16. The theme of the workshop was "Hydraulics of Ice Covered Rivers" and twenty nine papers were presented over the two day workshop. A special half day session was allocated to the ice-related work that is being carried out to support a remedial project on the Grass River in New York State. Recognition goes to Steve Daly of CRREL for his efforts in organizing and hosting the workshop. Thanks also go to our American friends and colleagues who participated in the workshop and helped to make it a local success. We hope to see them at upcoming workshops to be held at future Canadian venues.

2005 Annual Meeting

The meeting was held in conjunction with the 13th Workshop in Mount Ascutney. In addition to dealing with a number of ongoing committee business matters, the discussion focused on two important topics – the selection of new technical activities and committee renewal. A number of new technical initiatives were brought forward, including stability of lake ice, ice forces on structures, and improving the focus of the committee on riparian environmental issues. A shortlist of activities is in the process of being developed with a view to narrow the list down to two or three topics that can be pursued with some rigour. If you have any particular issues that you would like addressed please contact David Andres at dandrees@nhc-edm.com.

With respect to committee renewal, Ms. Chandra Mahabir, P. Eng. of Alberta Environment has accepted an offer to become a member of the committee. She will provide to the committee both a link to a provincial government agency that is very active in river ice (but has never been represented on the committee) and a sound understanding of the requirements and experiences of an operational ice forecasting group. An effort is also being undertaken to attract more membership from within our colleagues in Quebec. Both Quebec Hydro and Institut National de la Recherche Scientifique are active in ice-related work and would bring a valuable perspective to the committee.

The 2003 Gerard Medal

The Gerard Medal is awarded to the author(s) with the best paper presentation. A short list of nominated presenters is made on the basis of votes cast by workshop participants and the ultimate winner upon the review of the selected papers by a panel of independent judges. The 2003 Gerard Medal for the best presentation at the 12th Workshop in Edmonton was awarded to Twyla Kowalczyk and Faye Hicks (Twyla Kowalczyk, presenter) for their paper entitled “Observations of Dynamic Ice jam Release on the Athabasca River at Fort McMurray, AB”.

2006 Annual Meeting

The 2006 annual meeting will be held on June 24 and 25 in Fredericton, New Brunswick. The meeting will be split into two activities – a special technical session on the first day will provide a forum for practitioners in river ice to exchange ideas on a selected number of topics. The second day will be reserved for committee business. Brian Morse and Brian Burrell were instrumental in organizing and hosting the meeting.

14th Workshop, Quebec City, Quebec

The next workshop will be held on June 20, 21, and 22, 2007 in Quebec City. The event is being organized by Brian Morse, with the theme of the workshop to be announced shortly. We can all look forward to a delightful few days in the Old City at what will be a well organized and exciting event. For further information, or to submit an abstract, please contact Brian at Brian.Morse@gci.ulaval.ca.

2008 IAHR International Symposium on Ice – Vancouver, Canada

The committee is continuing to supporting the organization of the 2008 IAHR International Symposium on Ice. Martin Jasek has assumed the chair of the local organizing committee. The date and venue – July 6 to July 12, 2008 at The Coast Plaza Hotel and Suites at Stanley Park in Vancouver, Canada – has been selected. Work is still ongoing to attract individuals to help organize the “sea ice” component of the conference. If any one has any thoughts on this and other IAHR related issues please contact Martin at Martin.Jasek@BCHydro.bc.ca. Stand by for more news about this exciting and prestigious event.

GEODESY SECTION NEWS

Prepared by Marcelo Santos

As has been the case in the previous years, the Geodesy Section of the Canadian Geophysical Union had a series of important activities during the Canadian Geophysical Union Annual Meeting 2006, held in Banff, in May: Meeting of the Executive, Annual General Meeting, hosting of meeting sessions, Student Paper Competition and the Tenth Geoid Workshop.

Three Geodesy-related sessions took place during the CGU Annual Meeting: Geodesy and Geodynamics, with 14 papers, Geocomputations & Visualization, and Geophysical Studies, with 11 papers, and Cryosphere and the International Polar Year, with 11 papers. This resulted in a total of 36 papers related to Geodesy. Dr. John Wahr, from UCAR, was a guest speaker talking about the GRACE satellite mission.

There were seven *student papers* competing for the \$500 prize awarded by the Geodesy Section sponsored by the Geodetic Survey Division of NRCan. The winner was Mahmoud Abd El-Gelil, a graduate student at the

Department of Earth and Space Science, York University. The competing papers were:

- A Consistent Canadian Gravity Anomaly Database, by Ibraheem Ali, Spiros D. Pagiatakis
- On the Interpolation of Velocity Surfaces Using Radial Base Functions, by Elena Rangelova, Michael G. Sideris
- Levelling network analysis for the definition of a kinematic vertical datum in Canada, by B. Devaraju, A. Braun, N. Sneeuw
- Time Variable Gravity due to Seasonal Volume Changes in the Great Lakes derived from Satellite Altimetry and Tide Gauges, by W. van der Wal, J.A.R. Blais, M.G. Sideris, P. Wu
- Application of DInSAR-GPS optimization for derivation of three dimensional surface motion of southern California, by Sergey Samsonov, K. Tiampo, J. Rundle
- Atmospheric Density Admittance Function for Gravity Reduction, by Mahmoud Abd El-Gelil, Spiros Pagiatakis, Ahmed El-Rabbany

- Kernel Singularity Impact on the Wavelet Evaluation of Geodetic Integrals, by M. M. El-Habiby, M.G. Sideris

Another geodetic paper was recognized during the CGU Annual Meeting. Mr. Wouter van der Wal (see above) won the CGU best student paper award.

A new Geodesy Section Executive was elected:

- Marcelo Santos, President (UNB)
- Joe Henton, Vice-President (NRCan)
- Georgia Fotopoulus, Secretary (UofT)
- Rod Blais, Treasurer (UofC)

- Patrick Wu, Member-at-large (UofC)
- Alex Braun, Member-at-large (UofC)
- Spiros Pagiatakis, Past-President (York)

The **Tenth Geoid Workshop** that took place on 17 May 2006. This year, the main topics of the Workshop were the adoption of the Canadian Gravimetry Geoid 2006 as the new vertical reference for Canada, the proposals related to the International Polar Year, and the geodesy-related projects funded by the NCE GEOIDE Network. A photo of some of this year's participants is shown below.



Participants of the 10th Geoid Workshop, May 17, 2006, Banff Convention Centre

CGU 2006 Best Student Paper Award Winners

A number of awards were presented in recognition of outstanding performance in scientific research and presentation by students. Each of the awards comes with a \$500 monetary prize, except for the Campbell Scientific Award, which was \$1000. The awards were announced and presented at the CGU Awards Banquet on Wednesday, May 17, 2006. To be considered for an award, the student must be the first author and presenter

of the paper. The winners are listed below, and their abstracts are printed below. Extended abstracts will appear in the January 2007 issue of *Elements*.

The Organizing Committee of the CGU 2006 Annual Meeting and the CGU Executive Committee would like to sincerely thank all the judges of the student papers for their careful evaluations of the student presentations.

Student Oral Presentation Winners :

CGU Best Student Paper Award (all fields of geophysics)

Winner:

Wouter van der Wal (University of Calgary), "Time variable gravity due to seasonal volume changes in the Great Lakes derived from satellite altimetry and tide gauges." Co-authors: J.A.R. Blais, M.G. Sideris, P. Wu

Honourable Mentions:

Edwin Cey (University of Waterloo), "Investigating macropore flow and transport in the vadose zone using a tension infiltrometer." Co-authors: J. Passmore, D. Rudolph, G. Parkin.

Dru Heagle (University of Calgary), "The role of groundwater in regulating prairie wetland pond salinity." Co-authors: M. Hayashi, G. van der Kamp.

Chevron Canada Outstanding Student Paper in Seismology

Winner:

Johanna Wagstaffe (University of Western Ontario), "Seismicity of Southeastern Vancouver Island as detected using the British Columbia POLARIS array." Co-authors: D. Eaton, A. Yapp.

Honourable Mention:

C. Lopez (University of Victoria), "Seismic velocity structure associated with gas hydrate at the frontal ridge of the Vancouver Island margin" Co-authors: G. Spence, R. Dash.

D. M. Gray Award for Best Student Paper in Hydrology

Winner:

Chad Ellis (University of Saskatchewan), "Estimating shortwave irradiance through forest canopies on complex terrain." Co-authors: John Pomeroy.

Runner-up:

Pablo F. Dornes (University of Saskatchewan), "Representation of landscape heterogeneity in high-relief regions: implication for hydrological and atmospheric models." Co-authors: John Pomeroy, Al Pietroniro.

Geodesy Award for Best Student Paper in Geodetic Research & Education

Winner:

Mahmoud Abd El-Gelil (York University), "Atmospheric air density admittance function for high precision gravity reduction." Co-authors: S. Pagiatakis, A. El-Rabbany.

Student Poster Presentation Winners :

Shell Canada Best Student Poster Award (in areas other than hydrology)

Winner:

Catherine Alexandrakis (University of Western Ontario), "Structure of the outermost core from array analysis of SmKS phases". Co-author: D. Eaton.

Honourable Mentions:

Warren D. Helgason (University of Saskatchewan), "A robust technique for energy partitioning at the snow surface." Co-author: J. W. Pomeroy.

Gro Lilbaek (University of Saskatchewan), "Modeling preferential infiltration of ionic species into frozen soil." Co-author: J. W. Pomeroy.

Campbell Scientific Award for Best Student Poster in Hydrology

Winner:

Khawaja Faran Ali (University of Saskatchewan), "Factors controlling sediment yield in a major South Asian drainage basin: the Upper Indus River, Northern Pakistan." Co-author: Dirk H. de Boer.

Runners-up:

K. Harrison (McMaster University), “Peat hydrology and gas dynamics: atmospheric pressure and temperature controls on volumetric water content.” Co-authors: J.M. Waddington, E. Kellner.

Jaime L. Hood (University of Calgary), “Contributions of groundwater to Lake O'Hara, Yoho National Park”. Co-authors: M. Hayashi, James W. Roy.

The CGU 2006 Student Award Winners, plus abstracts



Left: John Pomeroy, CGU-VP (left), presenting the CGU Best Student Paper Award to Wouter van der Wal.



Right: Hugh Geiger, presenting the Chevron Outstanding Student Paper in Seismology Award to Johanna Wagstaffe



Left: Lawrence Martz (left) presenting the D. M. Gray Award for Best Student Paper in Hydrology to Chad Ellis.



Right: Marcelo Santos (left) presenting the Geodesy Award for Best Student Paper in Geodetic Research and Education to Mahmoud Abd El-Gelil.



Kai Muenzer (left) presenting the Shell Canada Best Student Poster Award (for areas other than hydrology) to Catherine Alexandrakis.

Time Variable Gravity due to Seasonal Volume Changes in the Great Lakes derived from Satellite Altimetry and Tide Gauges

W. van der Wal¹, J.A.R. Blais¹, M.G. Sideris¹, P. Wu²

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Seasonal lake level changes in the Great Lakes can measure up to 80 cm which results in geoid changes that are above the detection threshold of GRACE, although the spatial scale of the lakes is too small for them to be resolved in GRACE data. Therefore, Great Lakes water volume changes should be part of the geophysical interpretation of GRACE data over North America. Lake levels reflect the integrated precipitation over the catchment basins and therefore their magnitudes and phases are indicators of the continental water storage change for a larger area. However, lake levels are also

regulated by humans, and this needs to be considered as well.

Data from 50 tide gauges located around the Great Lakes are available from the Marine Environmental Data System and the National Oceanic and Atmospheric Administration. Gauge data provide good accuracy (± 1 cm) and temporal resolution (daily), however their spatial distribution is not ideal. For that reason, satellite altimetry measurements from ERS2, Envisat, Topex/Poseidon and Jason are used to extend the gauge data to the entire lake surface. The accuracy over the Great Lakes is limited to an rms of 10 cm compared to ground gauge data due to inaccurate modeling of the satellite orbits, the wet tropospheric delay and the inverse barometric effect. The two data sets are combined to form monthly lake surfaces which are converted to geoid changes relative to the two-year mean. The spectral signature of the expected geoid changes will be comparable to other geophysical signals in GRACE data, such as snow mass change and glacier melt, and this will help to separate the sources of mass change in GRACE data.

Seismicity of Southeastern Vancouver Island as Detected using the British Columbia POLARIS Array

J. Wagstaffe, D. Eaton and A. Yapp

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Through careful examination of POLARIS seismogram recordings from southwest British Columbia, we have identified and located approximately 150 previously unreported earthquakes in the southern Vancouver Island region. These events took place during 2003-2005, and

are generally small in magnitude ($M_w < 2.5$). Here, we report hypocenter locations for these events, together with source parameters derived from spectral measurements (seismic moment, corner frequency) of several of the largest events. The hypocenters were obtained by a simple least-squares inversion of P and S traveltimes, using the IASP91 Earth model for travel times of the waves. We also investigate the possible tectonic and hazard implications of our findings, in the context of cataloged seismicity for the area. Most of the previously unreported events are concentrated in linear bands near the Leech River Fault, Saanich Peninsula and adjacent San Juan Islands.

Estimating Shortwave Irradiance through Forest Canopies on Complex Terrain

Chad Ellis and John W Pomeroy

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Methods for estimating above and below canopy shortwave irradiance in complex terrain are required for energy balance snowmelt models and to evaluate impacts of forest cover change in mountains. Above-canopy irradiance to terrain orientations of varying slope and aspect was estimated using separate geometric corrections of beam and diffuse components, based on measured irradiance at an open, level site. The fractions of total shortwave irradiance consisting of beam (kb) and diffuse (kd) radiation were approximated using an atmospheric transmissivity index (kt). Various kd - kt relations were

assessed for their performance in estimating daily above-canopy irradiance at a southeast-facing slope. Estimates using empirical kt - kd relations had an RMSE of 16-17% of measured daily totals; the best estimates were provided by the relation $kd=1-kt$, having a corresponding RMSE of 8.5%. Sub-canopy solar irradiance was calculated using estimates of above-canopy beam and diffuse components and the respective canopy transmissivities. Transmissivity of beam irradiance was determined through calculation of the fractions of total surface area occupied by non-transmitting trunks, partially transmitting crowns, and fully transmitting canopy gaps along the beam path. Estimates of sub-canopy beam irradiance and observations of total above and below canopy shortwave irradiance at a level forest were used to determine the transmissivity of diffuse irradiance. Comparisons of predicted and observed sub-canopy solar irradiance show most reliable estimates are made for south-facing surfaces and least reliable for north-facing surfaces.

Atmospheric Air Density Admittance Function for High Precision Gravity Reduction

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University, Toronto, Ontario, M3J 1P3

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Atmosphere is one of the most significant disturbing sources to the surface gravity measurements after the Earth tide. Its effect is usually removed by using a transfer function called barometric pressure admittance. It is well known and reported that the barometric pressure admittance varies with frequency and time. In this presentation, a new admittance is proposed based on the atmospheric air density series, which is synthetic and derived from pressure, temperature and humidity

measurements. This air density is estimated following the equation of state (or gas law) for moist air. This admittance represents a reasonable gravity response to the air density fluctuations in a particular frequency band. In order to estimate the gravity response to the air density variations, we use the Least Squares Product Spectrum (LSPS) approach to identify common peaks in the gravity and atmospheric air density series. However, similar to the Fourier cross spectrum, the success of this method is guaranteed when only air density influences the gravity record in the band of interest. The novel air density admittance is applied on a three-year data from the Cantley (Canada) superconducting gravimeter (2000-2002) and has revealed a significant reduction in the noise level and improvement in the peaks amplitude. It is shown that this admittance varies during the year, which proves that the admittance is also a function of time or has a seasonal variation.

Structure of the Outermost Core from array analysis of SmKS Phases

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Recent studies have investigated the possibility of a low-velocity, low-density zone in the outermost 50 km of Earth's core, where the seismic velocity structure is not well constrained by existing standard Earth models. Here, we use differential arrival times and amplitudes of SmKS phases, since these are the only teleseismic phases that propagate for long distances in the outermost core. The

SmKS phase has reflected m-1 times from the underside of the core-mantle boundary. Previous investigations of these phases have focused on individual seismograms; in this study, we make use of dense seismograph networks, to enable the use of powerful array-analysis techniques. To avoid complications caused by passage through anomalies in the D" region of the lowermost mantle, it is necessary to average over a large number of observations. To achieve adequate global coverage, we use waveform data from many seismic networks including permanent and portable networks in Canada (POLARIS network), South Africa, Germany, Australia and Japan. By studying the travel times of these phases, a velocity model can be developed for the area of the core where the seismic wave traveled (i.e. the ray-path). Currently, there are several areas in the world where there is very little data available due to poor ray-path coverage. The development and analysis of an extensive SmKS ray-path database will result in a higher resolution global seismic

velocity map for the outer core by contributing new data to the poorly covered areas, and adding new data to the well covered areas.

Our array-analysis method uses the following steps: 1) calculation of full waveform synthetic seismograms (using code developed by S. Tanaka, Tohoku University, Japan) for a reference Earth model (e.g., PREM); 2) deconvolution of the observed seismograms, using the synthetic S2KS waveform as a reference pulse; 3) calculation of vespagrams (slant stacks); 4) measurement of arrival times, slowness and amplitude; 5) determination of confidence limits using a bootstrap technique. Preliminary results of this study confirm the probable existence of a layer at the top of the core with significantly lower velocities than predicted by PREM. We also observe larger-than-expected amplitudes of S3KS and S4KS phases, suggesting that some type of focusing or tuning may occur as a result of wave interaction with the CMB.

Factors Controlling Sediment Yield in a Major South Asian Drainage Basin: The Upper Indus River, Northern Pakistan

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The availability of fine resolution, global environmental datasets offers an opportunity to examine the relationships between specific sediment yield (SSY) and major controlling drainage basin variables in a GIS environment. This study examines the SSY at 17 long-term gauging stations within the upper Indus basin. Twenty eight environmental variables were extracted from global datasets, mostly at a 1 x 1 km resolution. The SSY ranges from 333 to 3270 t km⁻² yr⁻¹ for sub-basins ranging from 567 to 207,823 km². The high degree of scatter in SSY is greatly reduced when the data are grouped into three subsets, namely the main Indus River,

upper glacierized sub-basins, and lower monsoon sub-basins. The SSY increases significantly with specific runoff, mean slope and percent snow/ice cover. For the main Indus River, one of the dominant controls is the main channel length ($r^2 = 0.71$), which suggests a substantial role for bank erosion. A gradual flattening of the SSY and basin area curve shows the diminishing effect of basin size for larger sub-basins. Percent snow/ice cover is strongly correlated to SSY ($r^2 = 0.96$) for the upper glacierized sub-basins whereas precipitation appears to be a major control for lower monsoon basins. Basin area is not significantly correlated to SSY in the basin. A multiple regression model, including the specific runoff and percent snow/ice cover, explains 54% of the variance for the whole basin. The spatially distributed models developed in this study present valuable tools that predict SSY for ungauged sub-basins using specific runoff, percent snow/ice cover, relief ratio, population density, discharge peakedness and mean annual precipitation. The variables used are capable of explaining the majority of variance in the comparatively 'natural' upper glacierized tributaries, but are less adequate in the lower, monsoon-affected region because of data scarcity.

Statement of Cash Receipts and Disbursements (2005)

Receipts	2005	2004	2003	2002
Memberships				
Canadian Association of Physicists	195	210	135	345
Geological Association of Canada	1,299	1,299	1,377	118
Memberships Direct	3,420	3,242	3,513	3,586
Annual Meeting	9,551	16,163	-	64,232
Annual Meeting (previous year)	702	10,640	-	24,326
Bank Interest	350	1,288	423	2,045
CGU Conference Support	-	-	-	4,000
GSC Grant (Student Support)	4,000	4,000	4,000	4,000
Miscellaneous	1,509	231	-	337
TOTAL Receipts (Note 1)	21,026	37,073	9,448	102,989
Disbursements				
Newsletter	5,622	810	5,244	3,369
Prize for Best Student Papers/Poster	2,000	2,000	2,000	1,500
Student travel	5,375	4,225	5,700	5,600
Annual meeting (Translation, Travel)	6,690	1,709	5,906	8,720
CGU Executive Meetings	219	43	359	-
CGU-HS Student Conferences	-	572	244	-
Miscellaneous	348	453	30	250
Membership in Can. Geoscience Council	-	-	400	1,288
Bank charges	10	32	-	54
J. Tuzo Wilson Medal	-	-	4344	-
Seismix 2004 Student Support	-	3,000	-	-
PAGSE Membership	-	300	300	300
GAC Geophysics Division Award	-	300	-	-
Accountant, Lawyer Fees	6,484	-	-	5,906
Secretariat	5,893	3,400	200	3,500
TOTAL DISBURSEMENTS (Note 1)	32,642	16,844	24,727	30,488
Income less expenses (note 1)	-11,615	20,229	-15,280	72,501
TOTAL CREDIT: Canadian Dollars:	129,595	141,211	120,416	135,696
US Dollars:	0	0	438	438

NOTE 1. Includes US funds converted to Canadian Dollars

STATEMENT OF ASSETS	31 Dec-05	31 Dec-04	31 Dec-03
Savings account	76,885	76,446	58,982
Chequing account	3,992	16,552	12,687
Guaranteed income certificate	48,500	48,190	46,933
Credit with Canadian Ass'n of Physicists	241	46	1,836
Cash on hand	-23	-23	-23
Total: Canadian Dollars	129,596	141,211	120,416
US Dollars	0	0	438

Postdoctoral Fellowships at the Geological Survey of Canada

The Geological Survey of Canada, Ottawa, is seeking researchers for appointments of up to three (3) years in seismic projects under the Targeted Geoscience Initiative (TGI). Mineral exploration projects are being initiated in the Bathurst and Flin Flon mining camps. In the Bathurst project, two 3D seismic datasets of known ore deposits have been acquired. A reflection seismologist is required to develop and apply innovative imaging techniques in the hardrock environment with the goal of improving detection of massive sulphides on seismic records. In the Flin Flon project, 2D high-resolution seismic reflection profiles will be acquired, along with complementary rock property measurements, geophysical logs and vertical seismic profiles. A researcher is required to lead and implement all aspects of this seismic program, including processing, analysis and integrated interpretation of seismic data.

The fellowships are for one (1) year and are renewable for up to a total of three (3) years, with a salary of \$42,761 to \$47,761 per annum. Applications should include (1) a curriculum vitae; (2) a brief (one-page) statement summarizing relevant research experience, objectives and skills; (3) names and contact information for three referees; and (4) a list of publications. Applications should be sent to Dr. Don White, Natural Resources Canada, Geological Survey of Canada, 615 Booth Street, Ottawa, ON, Canada, K1A 0E9 (don.white@nrcan.gc.ca; Tel 613-992-0758; Fax 613-943-9285).

Bourses postdoctorales à la Commission géologique du Canada

La Commission géologique du Canada à Ottawa est à la recherche de titulaires de doctorat pour des postes de chercheur d'une durée maximale de trois (3) ans, dans le cadre de l'Initiative géoscientifique ciblée (IGC). Des projets en exploration minière viennent d'être amorcés dans les camps miniers de Bathurst et de Flin Flon. Dans le projet Bathurst, deux ensembles de données sismiques 3D sur des gisements de minerai connus ont été acquis. Nous cherchons une ou un spécialiste en sismique réflexion pour développer et appliquer des techniques d'imagerie innovatrices en roche dure, dans le but d'aider à la détection de sulfures massifs dans les données sismiques. Dans le projet de Flin Flon, des données de sismique réflexion 2D à haute résolution seront acquises, ainsi que des mesures complémentaires des propriétés des roches, des diagraphies géophysiques et des profils sismiques verticaux. Nous cherchons une chercheuse ou un chercheur pour gérer tous les aspects de ce projet sismique et veiller à sa mise en œuvre, y compris la compilation, l'analyse et l'interprétation intégrée des données sismiques.

Les postes sont d'une durée maximale de trois (3) ans et sont renouvelables annuellement, selon une échelle salariale allant de 42 761 \$ à 47 761 \$ par année. Votre demande doit inclure : (1) un curriculum vitae, (2) un sommaire (1 page) décrivant votre expérience pertinente en recherche, vos objectifs personnels et vos compétences, (3) les noms et adresses de trois répondants et (4) une liste de vos publications. Veuillez envoyer le tout à : M. Don White, Ressources naturelles Canada, Commission géologique du Canada, 615, rue Booth, Ottawa ON Canada K1A 0E9 (don.white@nrcan.gc.ca; tél. 613-992-0758; téléc. 613-943-9285).

Job Title: Research Associate
Job Status: Full time, 4 year term
Hourly Rate: \$21.52-\$25.31

Description:

The Department of Geography and Environmental Studies and the Cold Regions Research Centre, Wilfrid Laurier University, Waterloo, Canada, is seeking a Research Associate. The incumbent will be part of a highly productive team of university and government researchers focused on developing an improved understanding of and ability to model cold regions hydrological processes. The research team has brought together a substantial pool of expertise and equipment to the study sites, including Wolf Creek, near Whitehorse, Yukon; Scotty Creek near Fort Simpson, NWT; Trail Valley Creek and Havikpak Creek, near Inuvik, NWT, Polar Bear Pass, Bathurst Island, Nunavut; and several other high latitude and/or altitude sites.

Fieldwork:

Responsibility for the operation of scientific equipment at several research sites. Co-ordination of logistics for field campaigns including shipment of equipment and supplies to the field, and assisting with the set-up of field camps.

Laboratory Work:

Testing and calibration of field sensors. Water and soil sample preparation.

Data Analysis:

Data retrieval from study sites. Data quality control and database management. Data dissemination to research colleagues.

Working Conditions:

80% of the incumbent's time will be on campus, the remaining 20% will be in the field, (this may vary a little from year to year). He or she will go into the field at critical times, and would not normally stay more than two weeks at a time.

Qualifications:

University degree in environmental studies (e.g. agricultural or civil engineering, geography, geology, soil science, biology), or related field. Proficiency with computers and have some basic knowledge of electronics. Ability to program Campbell Scientific data loggers, and have an understanding of the operation of a range of environmental sensors. Willing to go into remote field settings to oversee operations.

PLEASE NOTE:

This position is available to external candidates and is represented by the WLU Staff Association bargaining unit. While we appreciate all applications, only those selected will be contacted. To apply, please forward a cover letter and up to date resume to Human Resources. The position will remain open until a suitable candidate is found. Resumes may also be emailed directly to recruit@wlu.ca, or to wquinton@wlu.ca. Please quote competition number #: 45-2006.

CMOS-CGU-AMS Congress 2007
St. John's, NL, Canada
28 May – 1 June 2007

Welcome

The CMOS-CGU-AMS 2007 Congress will be held at the St. John's Convention Centre and Delta Hotel from 28 May to 1 June, 2007. The Science Program Committee (SPC) aims to develop a unique science program that will cover topics in Earth sciences. Located in the heart of the easternmost North American historic city of St. John's, the Congress is sure to offer exciting sessions and a relaxing atmosphere. The SPC cordially welcomes your contribution and participation.

Congress Theme:

Air, Ocean, Earth and Ice on the Rock

The three societies cover a wide range of disciplines which are interrelated in many aspects. The theme reflects the Congress' objective to explore, link, bridge and integrate the scientific interests of the three societies.

The SPC have developed the following provisional sub-themes, some of which closely linked to the key objectives of the International Polar Year.

- Arctic Air-Sea Interactions
- Atmosphere-Cryosphere-Solid Earth Interactions
- Climate Variability and Change in the Arctic
- Cyber infrastructure and Geocomputations
- Coastlines and Coastal Ocean Dynamics
- Connecting Deep and Surficial Earth Processes
- Coupled Environmental Prediction Systems
- Data Assimilation in Numerical Modelling
- Geodynamics and Cryodynamics
- Humans, Societal and Environmental Changes
- Hydrology

- Monitoring Earth System Dynamics from Space
- Natural Resources, Water and the Environment
- Oceanography and Meteorology of the Northwest Atlantic
- Operational Oceanography and Meteorology
- Polar Environments and Teleconnections
- Polar Meteorology and Oceanography
- Snow, Glacier and Ice Sheets

We solicit your proposals for other sub-themes and welcome contributions on other topics in Earth sciences that are not listed above.

Science Program Committee

Guoqi Han (Co-chair, Fisheries and Oceans Canada)
Rod Blais (Co-chair, University of Calgary)
Mike Alexander (NOAA)
Uma Bhatt (University of Alaska, Fairbanks)
Jim Buttle (Trent University)
Fraser Davidson (Fisheries and Oceans Canada)
Brad deYoung (Memorial University of Newfoundland)
Colin Farquharson (Memorial University of Newfoundland)
Paul Ford (Environment Canada)
Ken Snelgrove (Memorial University of Newfoundland)
Taneil Uttal (NOAA)
Lucie Vincent (Environment Canada)

Important Dates

10 August 2006: Call for Session Deadline
15 February 2007: Abstract Submission Deadline

For more information, please visit:
www.cmos2007.ca.

If you have any suggestions on the science program, please contact:

Guoqi Han at hang@dfo-mpo.gc.ca
or
Rod Blais at blais@ucalgary.ca.

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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:

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Hydrology-specific submissions should be sent to:
Dr. Garry Thorne, Email: thorneg@aecl.ca.

Geodesy-specific submissions should be sent to:
Prof. Marcelo Santos, Email: msantos@unb.ca

Electronic submission is encouraged.