Elements

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THE NEWSLETTER OF THE CANADIAN GEOPHYSICAL UNION

IN THIS ISSUE

LE BULLETIN DE L'UNION GÉOPHYSIQUE CANADIENNE

President's Column

Colleagues and friends,

New Year's greetings to my fellow CGU-members! It has been a pleasure serving as CGU President in my first year in office. I have been stimulated by the energy and momentum in our Union. Over the past several months, we have been engaging with the Canadian Water Resources Association in planning our first joint meeting – "Earth, Wind and Water", to be held in Banff in June. The Canadian Geomorphology Research Group will also be joining us. Thanks to a lot of hard work behind the scenes from both our members and those of CWRA, the program is shaping up nicely, and the meeting promises to be an excellent technical and networking experience. The call for abstracts is out and registration is open, so start making your plans to join us in Banff now! And check out the conference logo that appears later in this newsletter – those of you who remember the 70s might recognize that we shamelessly cribbed the logo from an "Earth Wind and Fire" album cover (Illuminations) – with their permission of course. A special treat will be a viewing of the transit of Venus across the Sun that is conveniently taking place during our Icebreaker on June 5.

We have also been working on strengthening the ties amongst members of the Canadian Societies of Geophysical Sciences, and drawing new members. The CSGS is a mechanism to link, integrate and coordinate the relevant Canadian geophysical societies in their representations to the International Union of Geophysical Societies and to funding agencies, governments and Canadian society on critical Earth science issues. CSGS is also a mechanism to promote the public interest and support of the geophysical sciences through making decision makers and the public aware of the tremendous societal benefits that accrue from a vibrant and diverse geophysical science research community in Canada. Members of CSGS now include CGU, CMOS (Canadian Meteorological and Oceanographic Society), CSSS (Canadian Society of Soil Sciences), CWRA/CSHS (Canadian Water Resources Association/ Canadian Society of Hydrological Sciences) and CSAFM (Canadian Societies of Agricultural and Forest Meteorology). We are working with these partner organizations to revitalize CSGS and improve its interactions with our sister-society, CFES (Canadian Federation of Earth Sciences).

The functioning of CGU would not be possible without the dedicated hard work of our volunteer leadership team. I am grateful to Vice-President Brian Braunfireun for his collaboration, and his stewardship of the 2012 meeting as conference co-chair. The continued advice of Past-President Spiros Pagiatakis has been invaluable, particularly in revitalizing CSGS. Our Treasurer Richard Petrone keeps the financial machine running smoothly, while our Secretary Maria Strack keeps communications humming. We continue to rely on

the steady guidance of Rod Blais in organizing the technical program for our meetings. Ed Krebes keeps us informed through the twice-yearly Elements newsletter. We are also thankful for the work of our active section heads: Sean Carey for Hydrology, Sam Butler for Solid Earth, Altaf Arain for Biogeosciences and Patrick Wu for Geodesy. We are grateful for the efforts of Cherie Westbrook, who coordinates awards, for the past efforts of Hugh Geiger on awards, and for the contributions of our GAC Geophysics Division leader, Phil McCausland (who also arranged the solar telescope to view the transit of Venus in June).

Thanks to all for your hard work and dedication, which make it such a pleasure to be part of the CGU. Happy New Year, and see you in Banff!

Gail Atkinson

J. Tuzo Wilson Medal – Call for Nominations

The Executive of the CGU solicits nominations for the J. Tuzo Wilson Medal – 2012. 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. Cherie J. Westbrook, Chair of the CGU Awards Committee, University of Saskatchewan (Email: cherie.westbrook@usask.ca). 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 January 31, 2012. 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 – 2012. L'Union décerne la médaille chaque année "en reconnaissance d'une contribution remarquable à la géophysique canadienne". En choisissant parmi les candidats, on considére 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. Cherie J. Westbrook, Président du Comité des Prix d'Excellence, Université de la Saskatchewan (Email: cherie.westbrook@usask.ca). 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 31 janvier, 2012. 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
2007	Herb Dragert
2008	Ming-ko (Hok) Woo
2009	Garth van der Kamp
2010	Nigel Edwards
2011	Fred Cook

CGU Young Scientist Award – Call for Nominations

The Executive of the CGU solicits nominations for the CGU Young Scientist Award – 2012. 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. Cherie J. Westbrook, Chair of the CGU Awards Committee, University of Saskatchewan (Email: cherie.westbrook@usask.ca). The nomination should be supported by three letters of recommendation from colleagues. Nominations should be submitted by January 31, 2012. 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 – 2012. 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 recommendations 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. Cherie J. Westbrook, Président du Comité des Prix d'Excellence, Université de la Saskatchewan (Email: cherie.westbrook@usask.ca). Les nominations doivent être supportées de trois lettres de recommandation de collègues. Les nominations doivent être soumises avant le 31 janvier, 2012. 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
2007	No winner
2008	Brian Branfireun, Scott Lamoureux
2009	Gwenn Flowers, Stephane Mazzotti
2010	Sean Carey
2011	Michael Riedel

CGU Meritorious Service Award – Call for Nominations

The Executive of the CGU solicits nominations for the CGU Meritorious Service Award – 2012. 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. Cherie J. Westbrook, Chair of the CGU Awards Committee, University of Saskatchewan (Email: cherie.westbrook@usask.ca). The nomination should be supported by three letters of recommendation from colleagues. Nominations should be submitted by January 31, 2012. 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 – 2012. Le Prix pour Service Méritoire de l'UGC reconnait 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 recu 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 recommendations 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. Cherie J. Westbrook, Président du Comité des Prix d'Excellence, Université de la Saskatchewan (Email: cherie.westbrook@usask.ca). Les nominations doivent être supportées de trois lettres de recommandation de collègues. Les nominations doivent être soumises avant le 31 janvier, 2012. 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
2007	Ed Krebes
2008	Patrick Wu
2009	Garry Jarvis
2010	Zoli Hajnal
2011	Masaki Hayashi

CWRA-CGU Joint Assembly, Banff, June 5-8, 2012

Call for Abstracts: Elements 2012

The organizers of the Joint Assembly of the Canadian Water Resources Association (CWRA) and the Canadian Geophysical Union (CGU) are pleased to announce the Call for Abstracts for our national conference to be held between June 5 and 8, 2012 in Banff, Alberta. This first-ever joint meeting between our organizations presents a unique opportunity to bring together members, share knowledge, and establish common ground. For this meeting, we will also be joined by the Canadian Geomorphology Research Group (CGRG), the Canadian Society for Hydrological Sciences (CSHS), the Canadian National Committee for Irrigation and Drainage (CANCID), and the North American Stream Hydrographers (NASH).

The organizing committee is calling for abstracts in CWRA and CGU's common interest areas of Hydrology, Water Resources and Aquatics Sciences, as well as in Geodesy, Solid Earth, Biogeosciences, General Geophysics, and topics pertaining to any of the organizations participating in the 2012 conference.

Please visit our website at http://www.elements2012.ca/program.htm to see a list of special sessions to which abstracts may be submitted. Abstracts may also be submitted on topics outside of the special session themes, but related to the central theme of the conference.

Abstract submission deadline: **February 15, 2012**.

Abstract Submission Guidelines

Please submit abstracts in English or French via email to program@elements2012.ca. Abstracts must be submitted in Microsoft Word as an email attachment. The whole abstract submission must be no more than one letter size page (8.5" x 11") with a 1" border all around. A Times New Roman, 12-point font should be used. The abstract submission must include the following:

1. Presentation title (maximum of two lines in bold lower case letters)
2. Presentation author(s) (include name(s), institution(s) and/or affiliation(s), complete mailing address(es), phone and fax numbers, and correspondence email address(es)). Underline the presenter's name.
3. Abstract (maximum 250 words and may include figures)
4. Biographies of authors (maximum of 100 words per author)
5. Preferred presentation format (i.e., oral presentation, poster presentation, workshop)
6. Special session to which the abstract is submitted, or general session (A1 – General Session Abstract) if an appropriate special session is unavailable.

The email subject line must include the name and number of the special session that is most closely related to the central topic of the presentation. If your proposed presentation does not fall into one of the identified special sessions, please put "A1 – General Session Abstract" in the email subject line. The organizing committee will then determine the most suitable session for the abstract, upon acceptance. Please use the abstract submission template on our web site (or see below) that contains abstract submission formatting in English or French.

Please note that due to the volume of abstracts expected, the organizing committee will reject abstracts that are not submitted as per the guidelines detailed above. Should you have any questions regarding the abstract submission process, please contact one of the program coordinators listed at www.elements2012.ca/program.htm. For general information, please visit the conference website at www.elements2012.ca. New material will be added frequently over the next few months.

We look forward to seeing you in Banff in June 2012!

Your Program Committee Co-Chairs:
Rod Blais, Canadian Geophysical Union
Shaun Toner, Canadian Water Resources Association

Assemblée Conjointe de l'ACRH et de l'UGC, Banff, 5-8 juin 2012

Invitation de soumission de résumés : Éléments 2012

Les organisateurs de l'assemblée conjointe de l'Association canadienne des ressources hydriques (ACRH) et de l'Union géophysique canadienne (UGC) ont le plaisir de lancer un appel de soumission de résumés pour la conférence nationale qui aura lieu à Banff, Alberta, du 5 au 8 juin, 2012. En tant que première conférence conjointe entre nos deux organisations, nous avons l'opportunité unique de créer un lieu de rencontre pour nos membres respectifs afin qu'ils puissent partager les dernières connaissances et établir un terrain d'entente. Cette conférence inclura également la participation du Groupe canadien de recherche en géomorphologie (GCRG), de la Société canadienne des sciences hydrologiques (SCSH), du Comité national canadien de l'irrigation et du drainage (CNCID), et des Hydrographes de cours d'eau de l'Amérique du nord (HCEAN).

Le comité organisateur encourage la soumission de résumés dans les domaines d'intérêts communs à l'ACRH et l'UGC tel que l'hydrologie, les ressources hydriques, et la science aquatique, ainsi que la géodésie, la physique des systèmes, la biogéoscience, la géophysique, et tous autres sujets connexes aux organisations participantes à la conférence 2012.

N'hésitez pas de consulter notre site web (http://www.elements2012.ca/program.htm) afin de connaître la liste des sessions spéciales proposées pour lesquelles vous pouvez soumettre des résumés. Il est aussi possible de soumettre des résumés à l'extérieur des sessions proposées mais toutefois ils doivent être en ligne avec le thème principal de la conférence.

La date limite de soumission des résumés est le **15 février, 2012**.

Instructions pour la soumission d'un résumé

Tous les résumés dans un format Microsoft Word en Anglais ou en Français doivent être soumis en pièce jointe par courriel à l'adresse suivante : program@elements2012.ca. La soumission complète d'un résumé doit être contenu sur une page de format régulier (8.5" x 11") avec une marge de 1" tout autour. A font Times New Roman, 12 points, doit être utilisé. Chaque résumé doit contenir l'information suivante :

1. Titre de la présentation (maximum de deux lignes en bold minuscule)
2. Auteurs (incluant le(s) nom(s), institution(s) et/ou affiliation(s), adresse(s) postale(s) complète(s), numéros de téléphone et de fax, ainsi qu'une adresse courriel pour correspondance). Soulignez le nom de l'auteur présentant.
3. Résumé (maximum 250 mots incluant possiblement des figures)
4. Biographies des auteurs (maximum de 100 mots par auteur)
5. Format de présentation préféré (p. ex., présentation orale, affiche, atelier)
6. Session spéciale pour laquelle le résumé est soumis, ou soumission générale "A1 – Résumé pour la session générale" si aucune des sessions proposées ne convient.

L'objet du courriel doit inclure le nom et le code de la session spéciale la plus près du sujet central de la présentation. Si votre présentation ne se rapporte pas à l'un des thèmes des sessions spéciales proposées, veuillez indiquer "A1 – Résumé pour la session générale". Le comité organisateur déterminera la session la plus appropriée si le résumé est accepté. Veuillez utiliser le format de soumission d'un résumé en Anglais ou en Français sur notre site web.

Veuillez noter que, dans l'attente d'un nombre important de soumissions, le comité organisateur rejettera tous les résumés ne se conformant pas aux instructions présentées çi-dessus. Si vous avez des questions à propos du procédé de soumission des résumés, n'hésitez pas de contacter l'un des organisateurs de la conférence identifié sur www.elements2012.ca/program.htm. Pour plus d'information sur la conférence, veuillez visiter notre site web (www.elements2012.ca). Le site de la conférence sera mis à jour périodiquement durant les prochains mois.

Au plaisir de vous voir à Banff en juin 2012!

Votre comité organisateur :
Rod Blais, Union géophysique canadienne
Shaun Toner, Association canadienne des ressources hydriques

Abstract Submission Template (English)

Title of your presentation in bold lower case letters and no more than two lines

I.M. Presenter[1] & A. Coauthor[2]
[1]Department of Geoscience, University of Calgary, Calgary, Alberta, T2N 1N4
Phone: 403-220-5028 Fax: 403-284-0074, Email: impresenter@ucalgary.ca
[2]Département de biologie, Université Laval, Sainte-Foy, Québec, G1V 0A6
Téléphone: 418-656-1111 Fax: 418-656-1112, courriel: acoauthor@ulaval.ca

The abstract should not exceed 250 words. It may include both text and figures, but the full abstract submission (title, author's names, affiliations, and contact information, abstract, biographies) must fit within one standard letter size page (8.5" x 11") with a 1" border all around.

I. M. Presenter: PhD (Alberta); Associate Professor, University of Calgary
A. Coauthor: PhD (Montreal); Assistant Professor, Université Laval

Oral presentation

HW5 – Hydrology and the Urban Biophysical Environment

Le format de soumission d'un résumé en Français

Titre de votre présentation en lettres bold minuscules et pas plus de deux lignes

I.M. Presenter[1] & A. Coauthor[2]
[1]Department of Geoscience, University of Calgary, Calgary, Alberta, T2N 1N4
Phone: 403-220-5028 Fax: 403-284-0074, Email: impresenter@ucalgary.ca
[2]Département de biologie, Université Laval, Sainte-Foy, Québec, G1V 0A6
Téléphone: 418-656-1111 Fax: 418-656-1112, courriel: acoauthor@ulaval.ca

Le résumé ne doit pas dépasser 250 mots. Il peut inclure à la fois le texte et des figures, mais la soumission complète du résumé (le titre, le(s) nom(s) des auteurs, informations pour contact, le résumé et les biographies) doit être contenu sur une page de format régulier (8.5" x 11") avec une marge de 1" tout autour.

I. M. Presenter: PhD (Alberta); Associate Professor, University of Calgary
A. Coauthor: PhD (Montréal); Assistant Professor, Université Laval

Présentation orale

HW5 – Hydrology and the Urban Biophysical Environment

Canadian Institute of Geomatics: New President

The Canadian Institute of Geomatics (CIG) is pleased to announce its new President, Mr. Anthony (Tony) Sani. Mr. Sani, President of Spatial Geo-Link Limited and Sani International in Toronto, was sworn in at the CIG Annual General Meeting held last week in Montreal in conjunction with the Montreal symposium Geomatics 2011. He is joined on the CIG Executive by President-elect Mr. George McFarlane, Head, Surveys and Mapping, Public Works and Government Services Canada, located in Toronto; Vice President Mr. Steeve Guillemette, an Information Consultant with the City of Quebec and manager of its Geomatics Division of Sustainable Development and Infrastructure; Past President Dr. Matthew Tait, Director of Geomatics Engineering at WorleyParsons Canada Services Ltd. in Calgary; Treasurer Mr. Gilles Champoux, Directorate of Real Property Management with National Defence Headquarters in Ottawa; and Executive Director Mr. David Stafford, Ottawa.

More information is provided on the CIG website at www.cig-acsg.ca and full bios will be published in the December issue of Geomatica.

L'Association canadienne des sciences géomatiques (ACSG) est heureuse d'annoncer la venue de son nouveau président, M. Anthony (Tony) Sani. M. Sani, président de Spatial Geo-Link Limited et de Sani International à Toronto, a prêté serment la semaine dernière lors de l'Assemblée générale annuelle de l'ACSG, qui s'est tenue conjointement avec le colloque de la section de Montréal, Géomatique 2011. Il est rejoint sur le Comité exécutif de l'ACSG par le président élu, M. George McFarlane, responsable des Levés et de la cartographie de Travaux publics et Services gouvernementauxCanada, à Toronto; du vice-président, M. Steeve Guillemette, conseiller en système d'information (géomatique) à la Ville de Québec et coordonnateur des opérations courantes de la division géomatique de Développement durable et Infrastructures; du président sortant, M. Matthew Tait, Ph.D., directeur des services d'ingénierie en géomatique de WorleyParsons Canada Services Ltd. à Calgary; du trésorier, M. Gilles Champoux, de la Direction de la gestion des biens immobiliers aux quartiers généraux de la Défense nationale à Ottawa; et du directeur exécutif, M. David Stafford, d'Ottawa.

De plus amples renseignements se trouvent sur le site Web de l'ACSG à www.cig-acsg.ca et des biographies complètes seront publiées dans le numéro de décembre de *Geomatica*.

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CANADIAN INSTITUTE OF GEOMATICS
ASSOCIATION CANADIENNE DES SCIENCES GÉOMATIQUES

International Union of Geodesy and Geophysics
Union Géodésique et Géophysique Internationale

Michael Sideris is elected Vice President of the International Union of Geodesy and Geophysics

Dr. Michael G. Sideris, professor of geodesy in the Department of Geomatics Engineering at the University of Calgary, is the new Vice President of the International Union of Geodesy and Geophysics (IUGG, www.iugg.org) for the period 2011-2015. Prof. Sideris was elected to this prestigious position by the 69-country-member Council of IUGG at the XXV IUGG General Assembly, which took place in Melbourne, Australia, from June 28 to July 7, 2011. IUGG is an international organization dedicated to advancing, promoting, and communicating knowledge of the Earth system, its space environment, and the dynamical processes causing change. IUGG is a member of the International Council for Science (ICSU, www.icsu.org) and comprises the International Associations of:

- Cryospheric Sciences (IACS)
- Geodesy (IAG)
- Geomagnetism and Aeronomy (IAGA)
- Hydrological Sciences (IAHS)
- Meteorology and Atmospheric Sciences (IAMAS)
- Physical Sciences of the Oceans (IAPSO)
- Seismology and Physics of the Earth's Interior (IASPEI)
- Volcanology and Chemistry of the Earth's Interior (IAVCEI)

Prof. Sideris, who completed in May his term as Associate Dean in the Faculty of Graduate Studies at the University of Calgary – a position he held since 2003, also completed this month his 2007-2011 term as President of the International Association of Geodesy. As the Vice President of the IUGG, Prof. Sideris will be a member of its Bureau and its Executive Committee, and will be responsible for many administrative and scientific tasks, including the supervision of the Union's five Commissions, which serve the Union and the international geophysical community by promoting the study of particular interdisciplinary problems. These bodies, which are chartered by the IUGG Executive Committee to conduct inter-association science, are:

- Geophysical Risk and Sustainability (GEORISK)
- Mathematical Geophysics (CMG)
- Study of the Earth's Deep Interior (SEDI)
- Data and Information (UCDI)
- Climatic and Environmental Change (CCEC)

CGU 2011 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 monetary prize. The awards were announced and presented at the Awards Banquet at the recent 2011 CGU-CSAFM Joint Meeting in Banff. To be considered for an award, the student must be the first author and presenter of the paper (visit http://www.cgu-ugc.ca for details).

The award winners are listed below.

The extended abstracts of three of the winners (A. Biswas, A. Pawlak, and C. Marsh) appeared in the July 2011 issue of ELEMENTS. The remaining abstracts or extended abstracts (by C. Brillon, L. Xia, C. Oswald, J. Leach, and P. Vergados) appear below.

The CGU component of the organizing committee of the Congress 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.

CGU Best Student Paper (all fields of geophysics – oral presentations):

Winner: Asim Biswas (Dept. of Soil Science, University of Saskatchewan). Depth Persistence of the Spatial Pattern of Soil Water Storage in a Hummocky Landscape (co-author: B. C. Si).

Shell Canada Outstanding Student Poster Paper:

Winner: Camille D. Brillon (University of Victoria). Crustal Structure offshore Vancouver Island from Bayesian Receiver Function Inversion of NEPTUNE Seismic Data (co-authors: J. F. Cassidy, S. E. Dosso, W. Wilcock, E. Hooft, D. Toomey, and P. McGill).

Chevron Canada Outstanding Student Paper in Seismology (oral or poster):

Winner: Agnieszka Pawlak (Dept. of Geoscience, University of Calgary). Azimuthal anisotropy of Hudson Bay using ambient seismic noise (oral, co-authors: D. Eaton, S. Lebedev, F. Darbyshire, I. Bastow).

D. M. Gray Award for Best Student Paper in Hydrology (oral presentation):

Winner: Chris Marsh (Dept. of Geography & Planning, University of Saskatchewan). Implication of mountain shading and topographic scaling on energy for snowmelt (co-authors: J. Pomeroy, R. J. Spiteri).

Campbell Scientific Award for Best Student Poster in Hydrology:

Winner: Jason A. Leach (Dept. of Geography, University of British Columbia). Effects of clearcut logging on headwater stream temperature and simulated bioenergetic consequences for cutthroat trout (co-authors: R. D. Moore, S. G. Hinch, T. Gomi).

Geodesy Section Award for Best Student Paper in Geodetic Research & Education (oral presentation):

Winner: Panagiotis Vergados (Dept. of Physics & Astronomy, York University). Assessing the effect of gravity anomalies on GPS/RO-derived temperatures: Results from the GRACE mission (co-author: S. D. Pagiatakis)

Solid Earth Section Award for Best Student Paper:

Winner: Agnieszka Pawlak (Dept. of Geoscience, University of Calgary). Azimuthal anisotropy of Hudson Bay using ambient seismic noise (oral, co-authors: D. Eaton, S. Lebedev, F. Darbyshire, I. Bastow).

Biogeosciences Section Award for Best Student Paper (oral):

Winner: Lijun Xia (Dept. of Earth and Planetary Science, Johns Hopkins University). Soil respiration responses to temperature are affected by substrate supply and earthworm activities (co-author: Katalin Szlavecz).

Biogeosciences Section Award for Best Student Paper (poster):

Winner: Claire J. Oswald (Dept. of Geography, University of Toronto). Controls on the spatial distribution of ambient mercury and applied mercury isotope in a Boreal Shield soil landscape (co-authors: B.A. Branfireun, A. Heyes).

Crustal Structure offshore Vancouver Island from Bayesian Receiver Function Inversion of NEPTUNE Seismic Data

Camille D. Brillon[1,2], John F. Cassidy[1,2], Stan E. Dosso[1], William Wilcock[3], Emilie Hooft[3], Doug Toomey[3], and Paul McGill[4]

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This paper inverts receiver functions (RF) based on passive seismic data recorded by NEPTUNE (North-east Pacific Time-series Undersea Networked Experiments) to obtain a crustal model offshore Vancouver Island. In previous RF studies in northern Cascadia, knowledge of offshore structure was limited due to an absence of seismic monitoring in oceanic areas. The introduction of NEPTUNE, a cabled real-time seabed observatory offshore Vancouver Island, British Columbia, has expanded the research possibilities of many disciplines including RF analysis. Data from three permanent NEPTUNE broadband seismographs, as well as two previously deployed KECK autonomous broadband ocean bottom seismometers (OBS) are used here to determine the Moho depth, and therefore the crustal thickness of the Juan de Fuca plate (JdF). This work will ultimately lead to the first structural model of the JdF plate from the spreading ridge to the subduction deformation front.

We utilize three-component, broadband recordings of large (M6+), distant (30°-100°) earthquakes to compute RF's. These are characterized by locally generated P-to-S wave converted phases (P_s) and provide information on the shear wave velocity (v_s) structure directly beneath the recording sites.

Bayesian inversion is applied to NEPTUNE teleseismic data to provide marginal probability profiles of v_s, including the most probable model of the oceanic crust. Using a preliminary dataset of teleseismic events, results show that on the axial segment of the JdF ridge and abyssal plain (mid-plate), sediments are thin (<500 m) and underlain by 3-6 km of flat crust, while towards the east, sediments thicken and structure becomes more complex as the JdF plate begins to subduct beneath the North American plate.

Soil respiration responses to temperature are affected by substrate supply and earthworm activities

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The temperature dependence of soil respiration is of considerable ecological importance in the context of possible climate-change feed back effects. To look at if substrate supply and earthworm could influence soil respiration, we set up a field experiment in the temperate forests (an old forest and a young forest) at Smithsonian Environmental Research Center, on Chesapeake Bay, Maryland. We manipulated earthworm density (plus earthworm or minus earthworm), substrate supply (American beech or Tulip poplar) in the experimental plots. We measured soil respiration, soil temperature and soil moisture in the field manipulated plots from Nov 2008 to June 2010. Both average and seasonal temperature sensitivity Q_{10} were calculated based on soil respiration and soil temperature data. Q_{10} had a large seasonal variation with the annual minimum occurring in midsummer and

annual maximum occurring in the winter and spring. Seasonal values of Q_{10} were negatively related to soil temperature and had a complex relationship to soil moisture. Q_{10} value was higher in the treatments with leaf litter of American beech than Tulip poplar, indicating that the temperature dependence of low quality substrate is higher than high quality substrate. Q_{10} value was lower with higher earthworm density in the old forest, indicating that earthworms could change the overall temperature response by stimulating carbon decomposition and redistributing organic matter. The effects of substrate quality, earthworm activities, soil moisture and temperature on Q_{10} have important implications for predicting the response of terrestrial ecosystem to future global warming.

Controls on the spatial distribution of ambient mercury and applied mercury isotope in a Boreal Shield soil landscape

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Upland soil landscapes are a significant reservoir of atmospherically-derived mercury (Hg) and an important indirect source of Hg to aquatic ecosystems via runoff in many watersheds. Understanding the spatial controls on Hg storage in upland soil landscapes is essential for accurate predictions of the timing and magnitude of Hg fluxes and how they are related to hydrological and biogeochemical processes. The potential controls on Hg spatial distribution fall into three categories: controls related to deposition; controls related to the accumulation of soil organic carbon (SOC); and controls related to the movement of dissolved organic carbon (DOC) in runoff. In this study, we examined the spatial distributions of historically-deposited ambient Hg and an experimentally-applied Hg isotope (spike Hg), and the stoichiometry of the Hg-SOC relationship in different soil layers across the METAALICUS (Mercury Experiment to Assess Atmospheric Loading in Canada and the U.S.) catchment in northwestern Ontario. Specifically, we tested the hypotheses that canopy density and species type affect the mass of Hg in the soil profile and that there is a downslope increase in SOC and Hg in the soil landscape related to drainage conditions.

Our results showed significantly higher amounts of both ambient and spike Hg under old growth coniferous canopy than under deciduous canopy; however, correlations between the areal mass of ambient and spike Hg and leaf area index, an index of canopy density, were weak and not significant. The spatial distribution of spike Hg in all soil layers was best explained by the spatial patterns of cumulative spike Hg aerial loading. We found weak positive correlations between ambient and spike Hg mass in the well-humified organic soil layer and the topographic wetness index, which is higher in poorly-drained areas than well-drained areas. However, despite strong positive correlations between both ambient and spike Hg and SOC, we found no evidence of a downslope accumulation of SOC, ambient Hg, or spike Hg. Our results suggest that the dominant spatial controls on the Hg distribution in the soil landscape are deposition-related, and more specifically, related to tree species type and the ability of species to accumulate Hg from atmospheric deposition. Our results also suggest that in a topographically complex landscape where soil cover is discontinuous and hydrologic connectivity is limited, vertical fluxes of mercury into the soil profile dominate over horizontal fluxes that translocate mercury downslope.

Estimation of logging-induced stream temperature changes and bioenergetic consequences for cutthroat trout in a coastal stream in British Columbia, Canada

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Forest harvesting along streams reduces canopy shade and typically increases summer stream temperature due to increased solar irradiance at the water surface (Moore et al., 2005). In some cases, temperatures may rise above known thresholds for mortality or morbidity for species of concern (typically cold-water species such as salmonids), with clear biological consequences. In other cases, temperature increases may not produce mortality or morbidity, but could have behavioural or developmental consequences and influence growth rates, disease resistance and/or species competition. The primary objective of this study is to examine trout growth response to seasonal stream temperature changes following forest harvesting. In addition, the relative sensitivity of trout growth to increased food supply, as was observed at the study stream following harvesting, is also assessed.

The study was conducted at the University of British Columbia's Malcolm Knapp Research Forest, located approximately 60 km east of Vancouver, BC. Experimental stream A (59 ha), which provides habitat for both coho salmon and coastal cutthroat trout, is the focus of this study. Between October 19, 1998, and January 9, 1999, clearcut harvesting with no buffer occurred along a 325 m section of the stream. The control stream was East Creek (38 ha), located about 3 km northwest of A Creek.

Regression models, using two years of pre-harvest and four years of post-harvest daily stream temperature at the control and treatment streams, climate data, and terms accounting for autocorrelation, were used to estimate what the mean daily stream temperatures would have been in the post-logging period had logging not occurred. A bioenergetics modelling approach was used to explore the effects of stream temperature response to forest harvesting on cutthroat trout growth. The model used was the Wisconsin Bioenergetic Model (Hanson et al., 1997) which was calibrated with field measurements of trout growth from East Creek. Trout bioenergetics were simulated for the trout's first year following emergence, which was assumed to occur on May 1. The initial trout weight was set at 3 g. A Monte Carlo approach was used to quantify the effects of stream temperature uncertainty on fish growth, accounting for the inherent scatter about the statistical temperature models as well as uncertainty in the estimated regression coefficients.

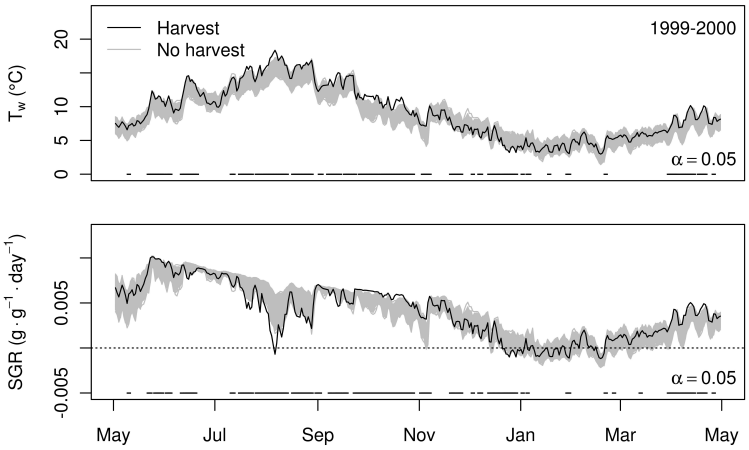

Figure 1: Top: Observed "with-harvest" stream temperature at A Creek (black line) versus 1000 Monte Carlo runs of estimated "no-harvest" stream temperature (grey lines) from May 1999 to April 2000. Bottom: Simulated specific fish growth (SGR) rates using observed stream temperature (black line) and 1000 Monte Carlo runs of estimated stream temperature (grey lines). The horizontal line segments at the bottom of each plot indicate that the value represented by the black line is statistically significant ($\alpha = 0.05$).

During spring, summer and fall, with-harvest daily mean stream temperatures were generally greater (up to 5 ℃) than no-harvest stream temperatures (Figure 1). Winter differences between with- and no-harvest stream temperatures were less pronounced, but with-harvest temperatures were found to be up to 4 ℃ lower than no-harvest temperatures, mostly occurring during the first post-harvest winter (1999-2000). Observed and predicted with-harvest stream temperatures rarely exceeded upper lethal limits of cutthroat trout.

Lethal stream temperatures were not a major concern during the study period, but sublethal stream temperature increases were estimated to significantly influence simulated trout growth rates at seasonal scales. Trout growth for the with-harvest scenario was greater during spring and fall but less during summer compared to the no-harvest scenario (Figure 1). The with-harvest scenario trout remained smaller (0.2 to 2.0 g) throughout the fall and winter, which may have negative implications for overwinter survival.

The bioenergetic model contains a parameter 'P', which represents the feeding efficiency of the trout. Adjusting P to account for an increase in food supply following harvesting appears to have the potential to more than compensate for metabolic costs of increased stream temperature (Figure 2). Trout growth simulated using the calibrated P of 0.14 used in all previous analyses were compared with two simulations using P of 0.16 and 0.18, reflecting

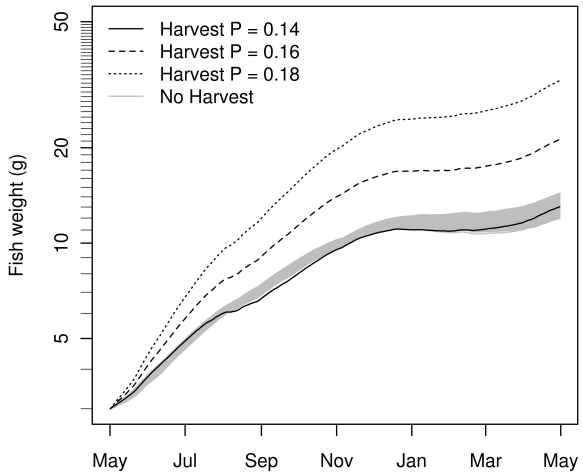

Figure 2: Simulated fish growth for one year following emergence (May 1st) at an initial weight of 3 grams during the first post-harvest year (1999-2000). Three harvest scenario fish growth estimates are provided using different values of model parameter P, (0.14, 0.16, and 0.18) which represents differences in trout feeding efficiency. The 1000 no-harvest estimated growth simulations (grey lines) assume a P of 0.14.

potential increases in feeding associated with an observed increase in macroinvertebrate abundance at A Creek following harvesting. Trout growth for simulations using a P of 0.16 and 0.18 resulted in considerably greater trout weights throughout the entire first year following trout emergence than does a reduction in stream temperature associated with the no-harvest stream temperature predictions.

This study highlights that sub-lethal stream temperature changes following harvesting can have significant effects on seasonal cutthroat trout growth. While post-harvesting impacts on aquatic ecosystems are complex, the approach taken here provides a heuristic framework for separating thermal influences of land-use change on aquatic organisms from other changes, such as increased food supply associated with changes in primary productivity.

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Assessing the effect of gravity anomalies on GPS/RO-derived temperatures: First results from the GRACE mission

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Abstract

This paper introduces a novel technique to identify the response of the Earth's vertical temperature profile to gravity anomalies. The approach is to combine measurements from active sounding techniques and global gravity field models. The Global Positioning System radio occultations (GPS/RO) are active limb sounding measurements that provide information about the Earth's thermal structure between 3 km and 50 km altitude. These measurements are retrieved at GPS/RO processing centers using the Earth's normal gravity field and thus, they are inherently biased by the Earth's gravity anomalies. Significant progress is possible with a joint retrieval combining the RO refractivity measurements with global gravity field models from the Gravity Recovery and Climate Experiment (GRACE) mission using the ideal gas law, in an atmosphere in hydrostatic equilibrium. Comparing the retrieved temperature profiles with those derived using the Earth's normal gravity field, we observe negative systematic temperature biases between 0.1 K and 0.5 K, in all cases studied. New scientific investigations can be enabled with this unique multi-instrument approach.

Introduction

The GPS/RO is an active remote sensing technique probing the Earth's atmosphere since 1995 [*Ware et al.,* 1996]. The principal observable during a RO event is the rate of change in the propagation delay of transmitted dual-frequency (f_1=1.57542 GHz; f_2=1.22760 GHz) GPS signals as function of occultation time, as they traverse the Earth's atmosphere (cf., Fig. 1), between a GPS and a LEO satellite located on opposite sides of the Earth's limb [*Vergados and Pagiatakis,* 2009].

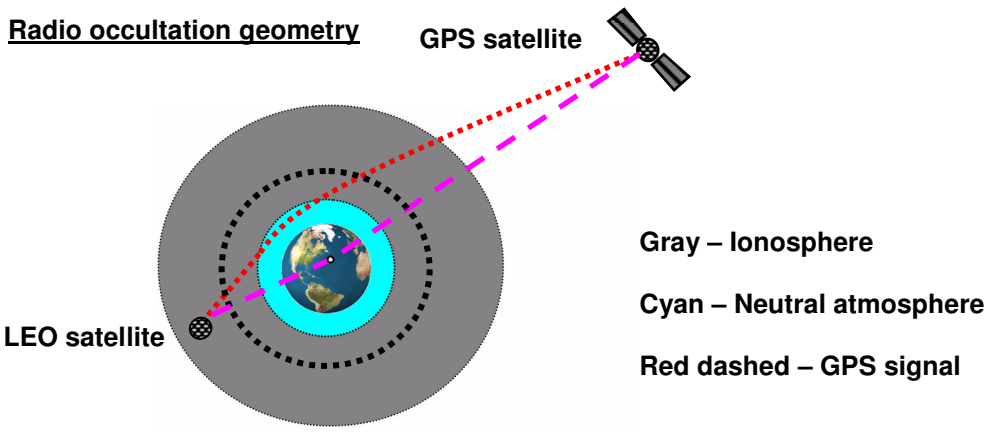

Figure 1: Schematic of a GPS-LEO radio occultation technique.

A GPS/RO profile of propagation delay is converted to an atmospheric refractivity profile using geometrical optics approximations, in which the GPS signal paths are treated as rays that curve in accordance to Snell's law. In turn, the atmospheric refractivity (N in N-units) is related to the total atmospheric pressure (P in mbar), temperature (T in K) and partial pressure of water vapour (e in mbar) through [e.g., *Hajj et al.,* 2002]:

$$N(z) = 77.6\frac{P(z)}{T(z)} + 3.73\times10^5\frac{e(z)}{T(z)^2}. \quad (1)$$

The first term in the right-hand-side (RHS) of Eq. (1) describes the Earth's dry atmospheric refractivity related to the ability of neutral atmospheric atoms and molecules to become polarized by incoming GPS signals. The second term in the RHS of Eq. (1) describes the wet refractivity component, which is associated with the absorption of GPS signals by water vapour molecules. In regions where the partial pressure of water vapour is negligible (above about 5 km; depending on the season and geographic location), the second term in the RHS of Eq. (1) is neglected and the dry atmospheric temperature is estimated directly from the atmospheric refractivity profiles. Assuming that the air is an ideal gas, the total atmospheric pressure is given by [*Clapeyron,* 1834]:

$$P(z) = \rho(z)R_{dry}T(z), \quad (2)$$

where $\rho(z)$ (in kg/m^3) is the atmospheric mass density and R_{dry} (m^3·mb/K·kg) is the specific gas constant for dry air. Assuming dry atmospheric conditions (e.g., e=0 at the RHS of Eq. (1)) and given atmospheric refractivity profiles from GPS/RO measurements, the vertical profile of the atmospheric mass density ρ is then computed by substituting Eq. (2) into Eq. (1) and getting:

$$\rho(z) = \frac{N(z)}{77.6R_{dry}}. \quad (3)$$

Next, we retrieve the atmospheric pressure profiles by downward integrating the retrieved atmospheric mass density profiles from Eq. (3) by assuming that the Earth's atmosphere is in hydrostatic equilibrium:

$$P(z) = P(ztop) + \int_{ztop}^{z}\rho(z')g(z')dz', \quad (4)$$

where $g(z')$ (m/s^2) denotes the Earth's gravity field as function of altitude. In Eq. (4), the pressure at the top of the atmosphere is defined either by climatological models or by satellite observations.

To-date, all GPS/RO processing centers, Numerical Weather Prediction (NWP) models and atmospheric Global Circulation Models (GCM), either assume the Earth's gravity field constant as function of altitude, or they calculate it by using the World Geodetic System 1984 (WGS84) Normal Gravity Formula [*National Imagery and Mapping Agency,* 2000]:

$$g(z) = 9.7803267714\frac{1+0.00193185138639\sin^2\phi}{\sqrt{1-0.00669437999013\sin^2\phi}} - 3.086\times10^{-6}z \quad (5)$$

where ϕ is the latitude and z the height above the mean sea level (MSL) (in km). Therefore, it is evident that the atmospheric pressure and temperature profiles estimated using Eq. (1) will always be negatively biased due to the Earth's gravity anomalies.

General methodology and procedure

To assess the impact of the Earth's gravity anomalies on the vertical structure of the Earth's temperature profiles derived from GPS/RO experiments, we propose an inter-disciplinary approach that combines multi-instrument satellite data products. We identify the geographic locations of maximum positive (e.g., Northern Atlantic Ocean, San Andreas Fault and Indonesian Peninsula) and negative (e.g., Hudson Bay and North Indian Ocean) gravity anomalies. We download GRACE monthly mean estimations of the spherical harmonic coefficients for the Earth's gravitational potential from the University of Texas Center for Space Research (UTCSR) to calculate the necessary gravity anomalies.

We select GRACE radio occultation events provided by the Data Analysis and Archive Center (DAAC) in Boulder, Colorado that occurred over the geographic locations with the maximum positive and negative gravity anomalies for the years 2008, 2009 and 2010. We calculate the Earth's gravity anomalies as function of altitude at the geographic locations specified above using the GEOPOT97 software provided by the National Geodetic Survey (NGS). The altitude grid for the calculations is provided by the GRACE/RO measurements. Adding the vertical profiles of gravity anomalies to the normal gravity field, we calculate the total gravity field values and we retrieve improved temperature profiles.

To examine the systematic biases introduced to the temperature profiles by the gravity anomalies, we compare the improved temperature profiles with the ones obtained using the normal gravity field (cf., Eq. (5)). The proposed analysis provides unique information on measurement biases and variances of atmospheric temperature profiles due to the Earth's gravity anomalies.

Results and discussion

The vertical distribution of the Earth's gravity anomalies in 2008, 2009 and 2010 for the months of January through December for selected geographic locations specified in the methodology section, as well as their mean annual variability have been retrieved. In all cases, the gravity anomalies decrease linearly with height and range between 19.58 mgal at the surface and 19.17 mgal at 60 km altitude above the mean sea level (MSL).

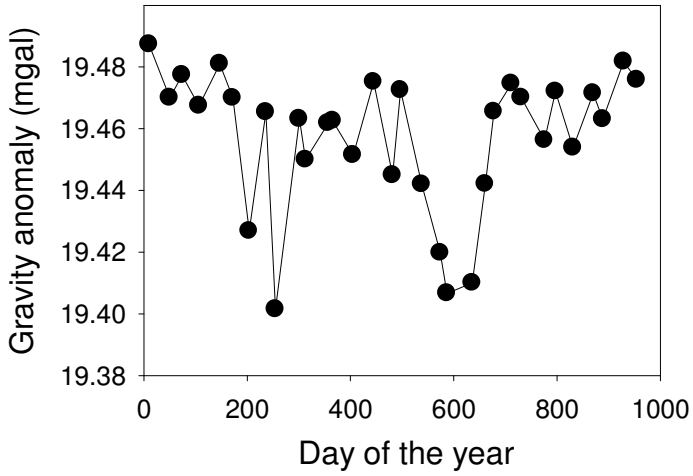

Figure 2: Annual variability of the Earth's monthly mean gravity anomalies from January 2009 (day 0) to September 2010 (day 955).

Figure 2 shows how the monthly mean of the Earth's gravity anomalies vary from January 2008 (day 0) to September 2010 (day 955). The monthly mean gravity anomaly values are computed by taking the mean of the vertical profile of the Earth's gravity anomaly and thus, correspond to an altitude of about 30 km above MSL. Figure 2 demonstrates that the seasonal variation of the mean gravity anomalies exhibits an oscillatory behaviour with two minima occurring in mid-July (day 253) with a

value of ~19.403 mgal and in mid-August 2009 (day 585) with a value of ~19.407 mgal. From August 2009, the mean gravity anomalies start to increase obtaining a maximum value of ~19.482 mgal in September 2010. A notable characteristic is that unlike in the previous years, in 2010 we do not observe a decrease in the mean gravity anomalies around the summer season.

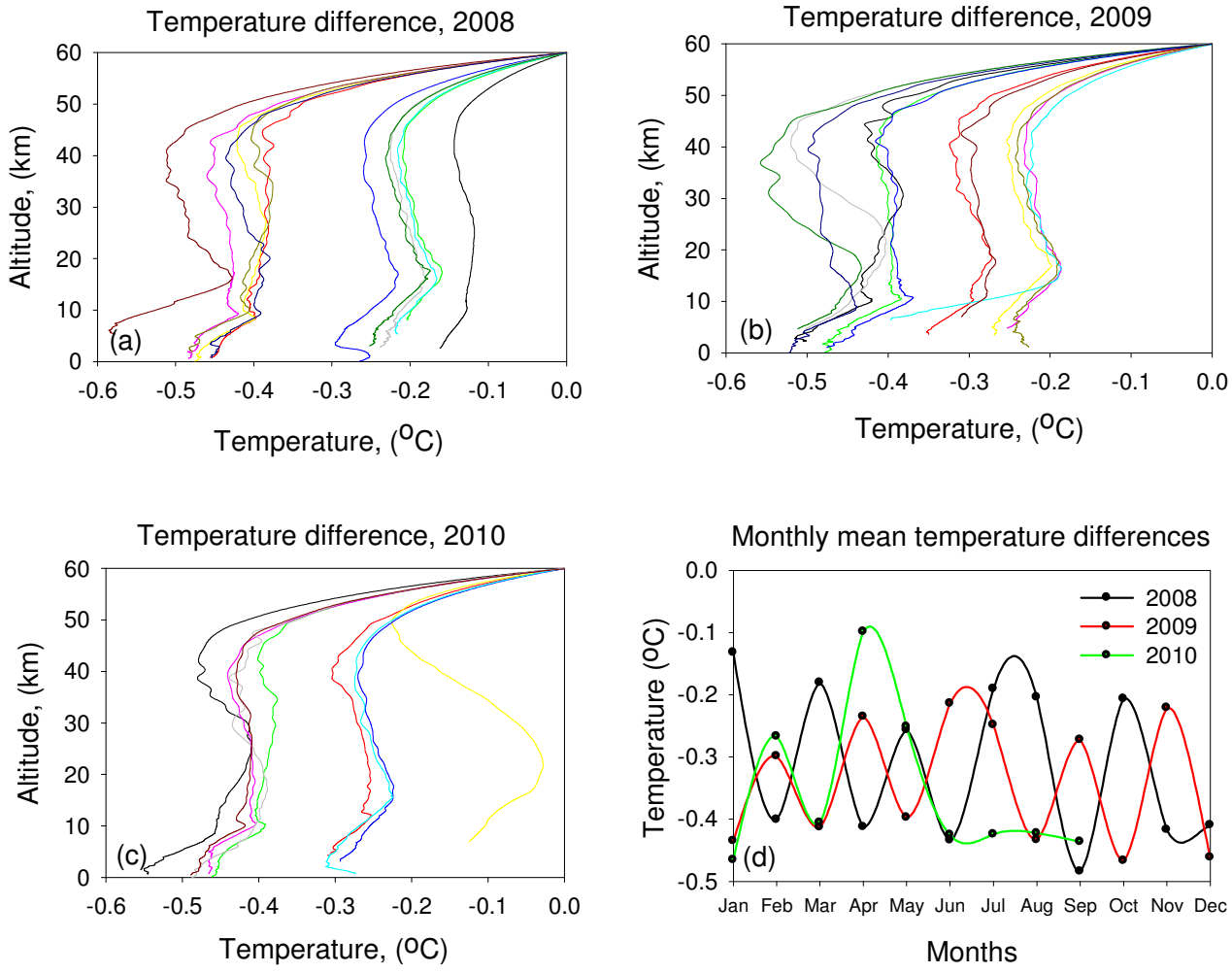

Figure 3: Vertical distribution of temperature differences between temperature profiles derived using GRACE gravity models and the Earth's normal gravity field for: (a) 2008, (b) 2009, (c) 2010 and (d) their mean annual variability.

Figure 3 presents the difference statistics between temperature profiles derived using GRACE gravitational field models (cf., Fig. 2) and the Earth's normal gravity field (cf., Eq. (5)) for the years 2008, 2009 and 2010 for the months of January through December for selected geographic locations specified in the methodology section, as well as their mean annual variability. Figure 3(*a-c*) shows that the temperature differences decrease as function of height, obtaining a minimum and a maximum value of about -0.5 K at the surface and -0.1 K at about 50 km altitude, respectively, in all cases studied. Figure 3*d* illustrates that the seasonal variability of the temperature differences follows a sinusoidal relationship that oscillates between minimum and maximum values of -0.5 K and -0.1 K, respectively (2008; black, 2009; red and 2010; green), following the trend of the monthly mean gravity anomalies presented (cf., Fig. 2). Figure 3*d* also shows that the amplitude of oscillation of the monthly mean temperature differences slowly increases from January through December, obtaining its maximum value between June and September coinciding with the sudden decrease of the Earth's gravity anomalies presented in Fig. 2.

Conclusions

Our limited knowledge about the relationship between the vertical distribution of the Earth's gravity anomalies and the dynamics of the Earth's thermal structure can introduce uncertainties on the parameterization of global climate and microphysical models, and therefore, on weather and climate research. To-date, general circulation models, Mumerical Weather Prediction centres and atmospheric dynamic models do not use the sophisticated global gravity field models provided by dedicated space missions (e.g., GRACE). Therefore, the precision and accuracy of the atmospheric parameters are inherently biased due to the Earth's gravity anomalies. The significance of this research lies on the fact that we are the first to present the complementary nature of GPS/RO measurements and global gravity field models. Our results reveal that the seasonal variability of the Earth's gravity anomalies as function of altitude follow a wave-like variability, which manifests itself as a sinusoidal effect on the Earth's temperature profiles. A mean gravity anomaly of about 19.5 mgal corresponds to a mean temperature bias of about -0.5 K. The effect of gravity anomalies on the Earth's thermal structure appear to be more profound between the months of June and September, where the temperature differences presented in Fig. 3*d* show increasing oscillation amplitude.

Significance and applications

The combined significance of GPS/RO measurements and global gravity field models can enable the development of new multi-instrument technologies and scientific retrieval methods for the statistical characterization of the Earth's thermodynamic parameters as they are influenced by the gravity anomalies. Of particular interest is the relationship between the global spatial distribution of the Earth's mass, their annual variability and their effect on the Earth's thermal structure. Reflecting this need, the GPS/RO+GRACE data products can be used to parameterize global atmospheric models and explore their effect on weather and climate studies. In turn, one can implement these improved atmospheric models in modern GPS applications such as, precise point positioning and plate tectonic monitoring, which nowadays require millimetre-level accuracy and accurate atmospheric corrections [*Bos*, 2005]. Strong emphasis will be given on applying this inter-disciplinary research and retrieval techniques on current and future satellite missions, in order to pioneer the complementary nature of geodetic and atmospheric satellite missions for the advancement of weather, climate and geodetic research.

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CGU-HS 2012 Eastern Student Conference

February 11, 2012

McMaster University

The Canadian Geophysical Union (CGU), Hydrology and Biogeosciences Sections in collaboration with the McMaster Centre for Climate Change and the School of Geography and Earth Sciences at McMaster University, are holding eleventh CGU Eastern Student Conference on February 11th, 2012.

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ABSTRACT Submission: Submit a 250 word abstract to **cgu.hs.2012@gmail.com** by January 27, 2012. Please include "ABSTRACT" in the subject line.

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Canadian Water Resources Association
Association Canadienne des Ressources Hydriques
Canadian Geophysical Union
Union Géophysique Canadienne