Message from the CCRN Principal Investigator

Our first Newsletter comes out as Christmas is fast approaching, so let me wish all CCRN’ers Happy Holidays, and very best wishes for 2015. December also coincides with our annual report to NSERC, which was submitted on the 1st (we will shortly be sending out copies to all co-Investigators). Our first year was very much taken up with recruitment, turning a project proposal into a detailed work plan, and generally getting our act together. Our second annual meeting, at Wilfrid Laurier in October, showed that an impressive amount of work is now underway, and also what a great team of researchers we have in place. It was particularly good to see the young researchers’ group taking off. The annual report highlights some of the significant achievements made to date. We are also making our presence felt on the international scene. We look forward to closer collaboration with NASA’s ABOVE initiative, and the World Climate Research Programme’s GEWEX and CliC projects. And as a number of us head to San Francisco, it is good to note that we have around 70 papers being presented at the AGU. I look forward to the exciting progress that I am sure we will make in 2015, and for those of you who I won’t see next week, I look forward to catching up with you in the New Year, perhaps at the January Theme A workshop at McMaster.

Professor Howard S. Wheater, FREng
Canada Excellence Research Chair in Water Security
Director, Global Institute for Water Security
Upcoming Events

CCRN Involvement at 2014 AGU Fall Meeting, San Francisco, CA, 15–19 December, 2014
This year’s Fall Meeting of the American Geophysical Union (15–19 December) will include 67 papers and 6 sessions presented or convened by CCRN members. These will feature many aspects of the science being pursued in the network or deal with topics of direct relevance to the network. There will also be a press conference on rain-on-snow floods featuring CCRN snowmelt research, which will be held at 4:00 PM on Wednesday Dec. 17 in the press conference room: Moscone West 3000. Live streaming of this event will be available through this link to AGU’s press conference webstreaming service.

➢ A file available for download lists all sessions and papers at this year’s meeting by members of the CCRN.

Northwest Territories Fire Workshop, Yellowknife, NT, 12–13 January, 2015
This 2-day workshop is organized to discuss priorities and planning for research in response to the widespread 2014 fires in the Northwest Territories. The workshop is by invitation only and is supported by the Government of the Northwest Territories, Wilfrid Laurier University, and the Changing Cold Regions Network. Participants will hear from various agencies in the GNWT and university and government researchers with expertise in high latitude boreal ecosystems and the impacts of fire on the function and resilience of these systems. Workshop outcomes will include: 1) the identification of information gaps, research priorities, and data needs relating to boreal wildfires; 2) the identification of opportunities arising from the 2014 fires that will help to inform management and planning during and after wildfires; 3) an initial plan of integrative research activities; and 4) the development of research teams to target research funds and undertake the research priorities. Those interested in becoming involved in fire-related research in the NWT, including leading or contributing to proposals to obtain research funding, should contact Jennifer Baltzer (jbaltzer@wlu.ca) or Jill Johnstone (jill.johnstone@usask.ca).

Workshop on Conceptual Models of Change, McMaster University, Hamilton, ON, 22 January, 2015
This 1-day workshop will focus on the development and advancement of conceptual models of change in the CCRN domain, particularly as applied to the Water, Ecosystem, Cryosphere, and Climate (WECC) observatories. Some conceptual models have been previously presented through CCRN, and this workshop will aim to take this further with the hope of compiling an ‘expert assessment’ style manuscript. Contact Sean Carey (careysk@mcmaster.ca) if you are interested in participating.

CCRN Session at the 2015 AGU-CGU-GAC-MAC Joint Assembly, Montreal, QC, 3–7 May, 2015
The Joint Assembly of the American Geophysical Union, Canadian Geophysical Union, Geological Association of Canada, and Canadian Mineralogical Society next spring will feature a session entitled ‘Changing Cold Regions: Climate, Cryosphere, Hydrology, Ecology’, which will include papers that address the observation, diagnosis, and/or prediction of one or more components of the changing cold regions Earth system: atmosphere, snowpacks, glaciers, permafrost, hydrology and terrestrial vegetation, particularly in northern latitudes and mountain regions. To see the full session description and to submit an abstract, visit the following webpage: https://agu.confex.com/agu/ia2015/webprogrampreliminary/Session6275.html. The deadline for all submissions is 14 January, 2015 11:59 PM EDT and no abstracts will be accepted after this date.
Reports and Announcements

CCRN 2nd Annual General Meeting, Wilfrid Laurier University, Waterloo, ON, 19–22 October 2014

The CCRN held its 2nd AGM at Wilfrid Laurier University in October, with 91 participants in attendance and 61 oral and poster presentations given over 3½ days. The meeting involved sessions on data management, individual science reports, CCRN Themes, northern science activities linked with CCRN, and the Special Observation and Analysis Period (SOAP) across all WECC observatories, which began 1 October. Ahead of the main meeting, a full day meeting of students and post-doctoral fellows in the network (the Early Career Researcher Network (ECRN)), was held 19 October, and consisted of oral and poster presentations by ECRN members, a WISKI (Water Management Information System KISTERS) training session, open discussions on the future directions of the ECRN, and an evening barbecue held at Waterloo Park. After the close of the AGM on the afternoon of 22 October, a focused mini-workshop was held to discuss and shape potential collaborative partnerships among the NASA Arctic–Boreal Vulnerability Experiment (ABoVE), the Canadian High Arctic Research Station (CHARS) initiative, the Government of the Northwest Territories, and members of the CCRN, particularly surrounding activities at the CCRN’s northern WECC observatories.

Overall, the CCRN AGM and other associated meetings and events were highly productive. Presentations revealed the depth and wide range of activities and progress made over the past year, and discussions shaped the future direction and goals of network activities and Themes. The meeting also enabled further building of collaborative relationships between the network members, and with some key partners. For further information on the 2nd AGM:

➢ See the 2nd AGM page on the CCRN website for all documents and copies of the presentations;
➢ A summary report is available for download here, which describes the meeting and its outcomes in more detail.

CCRN 2nd Annual Science and Progress Report, 1 December, 2014

On 1 December the network produced its 2nd annual progress report, which describes the many network activities and areas of scientific progress over the past year. Specifically, the report lists the major accomplishments achieved by CCRN in year-2 of the programme, describes the linkages between Themes and the progress made towards thematic objectives and deliverables, highlights meetings and workshops held in 2014, discusses data management activities and progress, and lists explains the recruitment and training of highly qualified personnel in the network. If you would like a copy of the report, please contact the network manager, Chris DeBeer (chris.debeer@usask.ca).
Proposal to the World Climate Research Program for CCRN as a GEWEX Regional Hydro-Climate Project (RHP)

In December 2012, GEWEX approved the Saskatchewan River Basin (SaskRB) Project as an initiating RHP, designed to support the GEWEX mission, imperatives and science questions, in particular the work of the GEWEX Hydroclimatology Panel. Subsequently, at the 7th International Scientific Conference on the Global Water and Energy Cycle held in The Hague in July 2014 it was suggested that there could be significant benefits from a broader RHP in western Canada that mirrored CCRN (SaskRB and Mackenzie River Basin (MackRB)). A proposal was produced to reflect this extension, including summary descriptions of the expanded context, science needs, facilities and science goals. It focusses on GEWEX Science Question (SQ) on Global Water Resource Systems (SQ2), but also has strong relevance to SQ1 (Observations and Predictions of Precipitation), SQ3 (Changes in Extremes) and SQ4 (Water and Energy Cycles and Processes). Given its geographical focus (from the Canadian Rocky Mountains in the West to Lake Winnipeg in the East, and from the Canada–U.S. border in the South to the Arctic Ocean in the North), this project would complement well current proposals for a U.S. RHP focussed on the Colorado Basin. The proposal was submitted to GEWEX on 30 October and we are awaiting a formal response, which is expected soon. The GEWEX Hydroclimatology Panel will be meeting in Pasadena, CA the week ahead of the AGU Fall Meeting, where the proposed extension of CCRN as an RHP will be discussed.

CCRN Overview Paper Published in Science China: Earth Sciences

In November, a paper describing the CCRN and its research programme, including the WECC observatory framework, was published in the journal Science China: Earth Sciences as an invited contribution to a special issue on watershed science, specifically contributing to a theme on watershed observing systems. The paper also describes environmental changes observed over the CCRN domain in recent decades.

➢ The paper can be accessed here.

Update on SSHRC-Supported Projects to Enhance CCRN Outreach and Engagement

Dr. Graham Strickert, the CCRN’s outreach coordinator, is leading and participating in two Social Sciences and Humanities Research Council of Canada (SSHRC) funded projects that aim to understand the concerns and information needs of stakeholders who are engaged in the management of land and water within the CCRN domain. The use of the social sciences to understand the world from the perspectives of stakeholders can help the CCRN to tailor its messages and products to enhance their salience, legitimacy, and credibility. Updates on each of these projects are provided below, and further information can be found at The GIWS Socio-Hydrology page.

Facilitated Empathy for Water Security in the Saskatchewan River Basin

The facilitated empathy project aims to improve our understanding of perceptions about water security in the Saskatchewan River Basin (SRB). The project includes three phases: 1) an online survey, 2) a Q-sort and 3) a decision making workshop. In Phase 1, 70 people from the SRB’s water sector responded to the survey. It asked participants to rank their concerns about water management, prioritize water uses during crises, identify what should drive water allocation, share their views on policy documents which drive water management in the prairies, and included an open-ended question “what does water security mean to you?” In Phase 2, 57 participants responded to the online Q-sort. Stakeholder definitions of water security were categorized to enable a systematic study of people’s subjective views of water security. In Phase 3, more than 100 stakeholders participated in a workshop which examined the influence of water policies, water scarcity, and basin location on water allocation choices to key water sectors including: agriculture, industrial, municipal and environmental services. Once available the results of each phase are
shared with participants whose feedback has helped to shape the direction of the project. The final results of the project will be available in the spring of 2015. The tools being developed in this project, e.g. user interface for water allocation experiments, can be connected to CCRN’s large-scale modelling activities and contribute human dimensions to future scenario analyses.

The Delta Dialogue Network (DDN)
The DDN brings together toxicologists, social scientists, biologists, and hydrologists to determine how research on air, water, and wildlife can support decision making in the Peace-Athabasca, Slave, and Saskatchewan River Delta communities. The project aims to address the effects of climate change and regional development on downstream communities, and how to share scientific information effectively. Over the course of the fall, the DDN has focused on building relationships and clarifying research questions in these delta regions. In October, a project manager was hired to support research and facilitate communication between partners, co-investigators, and students in each of the inland deltas. The DDN project in the Saskatchewan River Delta, which centers on youth perspectives of water, is currently being implemented, while knowledge mobilization projects in the remaining two deltas are still in the design phase. In November, the project manager and one of the Master’s students met with partners in the Peace-Athabasca Delta to get feedback on the direction of the DDN and its related projects. The discussion generated from this meeting validated the significance of collaborating with community-based partners, which will continue to be a priority as the DDN builds momentum going forward. Next steps for the DDN will be to solidify the design of research projects and improve the capacity of our network to effectively communicate, through means such as web development and in-person meetings. Knowledge gathered through the DDN community engagement and CCRN science programme will together provide an enhanced capacity to support community decisions.

Ongoing Research

Detection of 20th Century Air Temperature and Precipitation Changes in the Mackenzie and Saskatchewan River Basins – K.P. Chun
Dr. Kwok Pan (Sun) Chun is a postdoctoral fellow at the Global Institute for Water Security (GIWS), University of Saskatchewan, working under the supervision of Professor Howard Wheater. Sun joined the GIWS in early 2011, coming from Imperial College London, and has since been involved with research involving statistical analysis of hydro-meteorological data and downscaling of climate model outputs. Some of his work over the past year represents an important contribution to the CCRN’s Theme A objectives of synthesizing observed recent changes of the Earth system in the CCRN domain through the inventory and statistical evaluation of these changes. The work by Sun in particular has examined regional trends and variability in air temperature and precipitation over the past century, building on a large amount of previous climate research in Canada and providing a complete and up-to-date assessment of the changes over the Mackenzie and Saskatchewan River Basins. This also provides regional context for more detailed local-scale analyses of data from the CCRN Water, Ecosystem, Cryosphere, and Climate (WECC) observatories.

The analysis used gridded time series data (Environment Canada’s CANGRD product), derived from spatial interpolation of the Adjusted and Homogenized Canadian Climate Dataset (AHCCD; www.ec.gc.ca/dccha-ahccd/). Trends were computed at each grid point from de-autocorrelated time series using the methods of Zhang et al.\(^1\) and Sen\(^2\), and the P-value of the trend slope at each was computed using the Mann-Kendall rank trend test. Analyses focused on the historical period between 1900 and 2012.

Figure 1 shows the annual average daily maximum and minimum temperature and the total annual precipitation time series, spatially averaged over the Mackenzie and Saskatchewan River Basins. Over the period 1900–2012, average daily maximum air temperature increased overall by 1.8 °C and 1.1 °C across the Mackenzie and Saskatchewan River Basins, respectively, while average daily minimum air temperature increased by 3.2 °C and 2.3 °C. This indicates greater warming in the more northern Mackenzie Basin and a decreasing daily air temperature range over both basins. All air temperature series show an increased rate of warming in the latter half of the 20th century. Total precipitation increased by 93 mm over the Mackenzie Basin and by 50 mm over the Saskatchewan Basin.

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Figures 2 and 3 show the spatial patterns of average annual and seasonal air temperature, and total annual and seasonal precipitation trends across the region for the period 1950–2012. Warming patterns have been spatially coherent and the increasing trends have been statistically significant over nearly the entire domain in all seasons, with the exception of the fall period. The greatest warming has been observed during the winter, especially in the northern Mackenzie region, with increases of over 5 °C here since 1950. Spatial patterns in precipitation trends have been more varied across the region. On an annual basis, statistically significant increases have been observed over the northern Mackenzie Basin, while trends were weaker in magnitude and not significant in most other parts of the domain. Most seasons show similar spatial patterns and magnitude of trends as those of total annual precipitation. The contrast between trends in northern and southern areas is greatest for the winter season, when there have been increases of up to more than 100% in the northeastern Mackenzie region and decreases of up to –70% in the southern Mackenzie and southwestern Saskatchewan Basins.

These results have contributed to a recently published CCRN overview paper, and will support a broader review paper in preparation on observed environmental changes over the CCRN domain. The work will also be presented at this year’s AGU Fall Meeting (see the listing of CCRN papers). To help provide regional, long-term context for more detailed local-scale analyses of changes at the WECC observatories, trends were extracted for CANGRD points nearest to each observatory. A report on this can be downloaded through this link, while the data and results can be made available to those interested in exploring how recent changes at WECC sites relate to the long-term variations from CANGRD by contacting Sun Chun (sun.chun@usask.ca), or the network manager, Chris DeBeer (chris.debeer@usask.ca). The next steps in this work are to analyze monthly trends and variability over the CCRN domain and to explore changes in variables that have important ecological implications, such as the timing and location of the spring and fall season zero degree isotherm, again building on previous Canadian research.

Figure 1: Time series of average daily maximum and minimum air temperature and total annual precipitation over the Mackenzie and Saskatchewan River Basins (MRB & SRB)
For more information or to contribute material for the next issue, please contact the network manager, Chris DeBeer, at: chris.debeer@usask.ca (306) 966-6224; www.ccrnetwork.ca