PACIFIC CLIMATE IMPACTS CONSORTIUM

PCIC UPDATE

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Regional Climate Services Workshop 2011

Over 90 delegates from the growing community of professionals working at the interface between climate science and climate policy participated in PCIC's Regional Climate Services Workshop 2011.

"Exploring Regional Climate Services: Meeting Stakeholder Needs for Practical Climate Information" was a two-and-a-half day workshop held at the University of Victoria November 21-23 to explore the various dimensions of regional climate services. The event attracted representatives from regional climate service organizations across Canada, the US and Germany, together with climate scientists, climate stakeholders and communicators. The workshop set out to address the challenges of regional climate service delivery with particular attention to communication challenges.

Representatives from regional climate service organizations, climate scientists, communicators and other stakeholders gathered at the University of Victoria for the PCIC-HZG organized Regional Climate Services Workshop 2011 in November.

On the first day of the meeting, representatives from interest groups such as the Columbia Basin Trust, Parks Canada, and investment services shared the stage with researchers, national governmental organizations like Natural Resources Canada and Environment Canada, as well as regional climate service providers like PCIC, Ouranos and the University of Washington's Climate Impacts Group. The presentations and subsequent discussion set the stage for the second day, which focused on communication challenges.

The second day built on the premise that there remains a divide between the provision of climate science and the ability of stakeholders to take up climate information. Thus, the presentations from PARC, Environment Canada, and ICLEI focused on the difficulties of translating climate science information for a stakeholder audience. As well, communications specialists from the US and Germany shared their expertise on the strong role that mass-media plays in mediating the flow of climate information and its implications for regional climate service delivery.

The final day took a case-study approach and focused on the specific experiences of providing and using regional climate services in British Columbia. Some speakers represented the perspective of stakeholders including BC Hydro, Fisheries and Oceans Canada while others informed the audience on advances of research in areas such as forest genetics and freshwater vulnerability.

In addition to the presentations, workshop attendees participated in a collective authorship exercise whereby each was assigned to one of five writing groups tasked with exploring a workshop session theme. The purpose of these writing groups was to develop a draft manuscript

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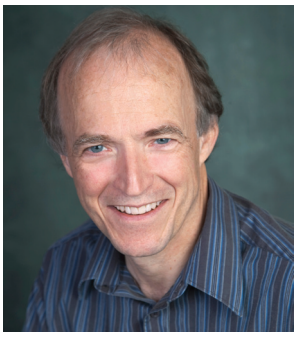

PERSPECTIVE

Message from the Director

Despite La Niña, 2011 was a warm year globally. Initial analyses by both NASA and NOAA rank it as lying firmly above the 90th percentile of annual global mean temperature anomaly estimates based on instrumental observations since 1880. NASA's preliminary estimate is that 2011 was 0.51°C warmer than 1951-1980 average values, and that 2011 ranked ninth warmest since 1880, with nine of the 10 warmest years on record occurring since year 2000. NOAA's preliminary estimate is similar, 0.51°C warmer than the 20th century average and the 11th warmest year on record overall. The differences in ranking from the two agencies reflect the fact that some uncertainty remains in estimates of the global mean temperature anomaly, even with today's extensive observation system. This uncertainty arises from incomplete global observational coverage, small instrumental errors, and differences in the methods that are used by the two centres. Despite these uncertainties, it is clear that last year ranks amongst the warmest 10 or so in more than 130 years of instrumental observations globally.

The BC story for 2011 is interesting because it shows the important effects that La Niña has on our region. The effects of global warming are as strong and persistent here as they are elsewhere, but that signal is expressed in the context of strong natural year-to-year fluctuations that arise from El Niño/La Niña and other causes. Based on a preliminary analysis at PCIC of the 62 years of temperature data collected by Environment Canada since 1950, last year was about average. Nevertheless, the background tendency towards warmer temperatures is clear in these observations. The 62-year trend shows an overall warming of about 0.25°C per decade, which is substantially greater than the global trend of 0.13°C per decade reported by the IPCC for the period 1956-2005. Note that greater warming over land and at high latitudes is a feature of the expected pattern of response to increasing greenhouse gas concentrations, and thus it is not surprising that BC should have a larger trend than observed globally. Furthermore, eight of the last 15 years in BC rank amongst the 15 warmest years since 1950—an outcome that would have had only about a 1.5% probability of occurring by random chance. Thus, despite high regional variability in BC, the overall long-term warming trend is clear.

The warming and its impacts, both realized and potential, have not been lost on PCIC's users, who range from the general public to both public and private organizations of all sizes. Many such organizations are actively seeking reliable climate information from PCIC so that they can assess the impacts of future change in the context of historical change and variability, to plan adaptation measures. In serving our users, our objective is always to produce carefully vetted quality products that they can rely upon.

The new PCIC data portal is a case in point. The beta-release that will occur in a few months (see Page 4) represents what is essentially the beginning of the end for the design of the basic architecture of the portal. The design exercise is important because the site will have to be reliable, flexible and easy-to-use. It will also need to be able to provide users with authoritative climate data in a range of formats so that they, in turn, can further analyze the information using their favourite analysis tools. The portal needs to be able to serve up both station data, which are scattered

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irregularly around the province and the Pacific and Yukon region, and gridded data, including analyses of observations and climate change scenarios based on a range of climate models and forcing scenarios. Building in such flexibility is a challenge given that station data and gridded data are organized in fundamentally different ways (by location in the case of the former, and by time for all locations in the case of the latter).

Moreover, gridded datasets from various sources use a large number of different grids and grid geometries. In addition, the tool needs to be scalable to allow PCIC the capability to provide users with access to a growing data library that currently occupies 55 terabytes, and is anticipated to grow by a factor of 10 every three years for the foreseeable future as observing and modelling capabilities continue to improve. Under the hood, the new PCIC data portal has been designed so that it will be able to meet all of these challenges.

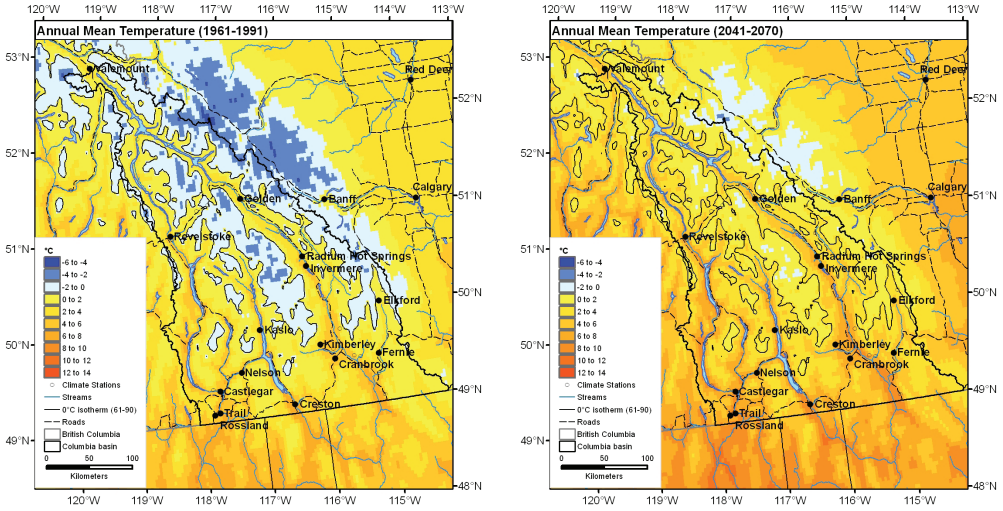
The beta-release of the PCIC data portal will initially provide access to only a part of PCIC's current holdings, but the scope of access will grow substantially in coming years as capability and data are added to the structure that James Hiebert and his team have developed. Careful planning and implementation now will lead to a durable and robust tool that we expect will be able to serve PCIC and its users well over the long term as they venture further down the path of climate change adaptation.

NEW PUBLICATIONS

Canadian Columbia Basin Climate Trends and Projections: 2007-2010 Update

In November 2011 PCIC published "Canadian Columbia Basin Climate Trends and Projections: 2007-2010 Update", a follow-up to its 2006 preliminary analysis of climate variability and change affecting select communities in the Canadian portion of the Columbia Basin.

The report provides additional information that was not available during the previous regional assessment. It was undertaken in partnership with the Columbia Basin Trust (CBT) and in support of the CBT's Communities Adapting to Climate Change Initiative.



Maps showing projected changes in annual mean temperature for the Canadian Columbia Basin. The map on the left shows annual mean temperature for the baseline period 1961-1990 while the map on the right shows projected annual temperature by 2041-2070.

The report provides updated maps and tables that are intended to communicate historical climate trends and future climate projections in the region for the benefit of those involved in community adaptation planning.

Selecting and Using Climate Scenarios for British Columbia

PCIC recently published guidelines for the selection of climate scenarios by those who undertake climate change impact, vulnerability and adaptation analyses in British Columbia.

"Selecting and Using Climate Change Scenarios for British Columbia" provides both advice and rationale for choosing subsets from among the many available climate projections. The report identifies five common uses of scenarios and recommends sets of scenarios for each type. It builds on previous work by the Intergovernmental Panel on Climate Change (IPCC) to provide guidance on the use of scenarios presented in its Fourth Assessment Report. The PCIC guidelines add a regional focus, including discussion on tools and sources of data specific to British Columbia and western North America.

All PCIC publications are freely available online at ***http://pacificclimate.org/publications****.*

PROJECT FOCUS

PCIC Data Portal

PCIC is developing a new online tool for improving access to the large amounts of climate and hydrological data it has been collecting through various applied research projects, including historical meteorological data gathered at thousands of locations across British Columbia.

The PCIC Data Portal will provide access to decades worth of observed time series data for temperature, precipitation and a host of other climate variables—in some cases going back as far as the late 19th century. This data has been collected by a vast and diverse network of observation stations scattered across the province. Environment Canada, BC Hydro, Rio Tinto Alcan and various BC government ministries have each developed and managed a part of this network for their own operational needs. Recently, they agreed to share this data under the Climate Related Monitoring Program (CRMP), spearheaded by the BC Ministry of Environment in support of the province's Climate Change Adaptation Strategy.

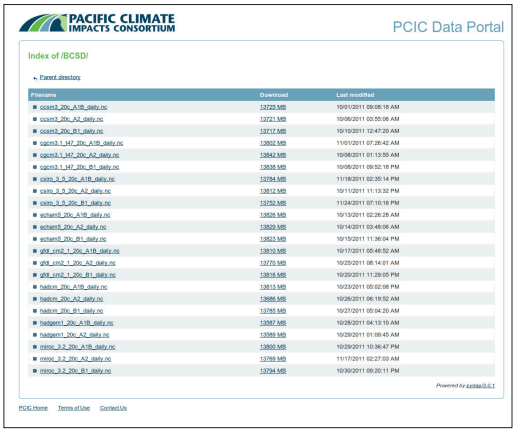
PCIC is contributing to the realization of CRMP goals through its Climate Analysis and Monitoring Program. PCIC is building a centralized inventory of climate data gathered through the CRMP network as a first step towards developing a Provincial Climate Data Set that it will manage for the benefit of CRMP members and the general public. The PCIC Data Portal will become the primary means for distributing this climate data to those who need it.

However, the products that will eventually become available through the PCIC's data portal won't be limited to CRMP network data. The tool will also provide historical and future climate and hydrologic impacts scenarios under PCIC's Hydrologic Impacts and Regional Climate Impacts programs.

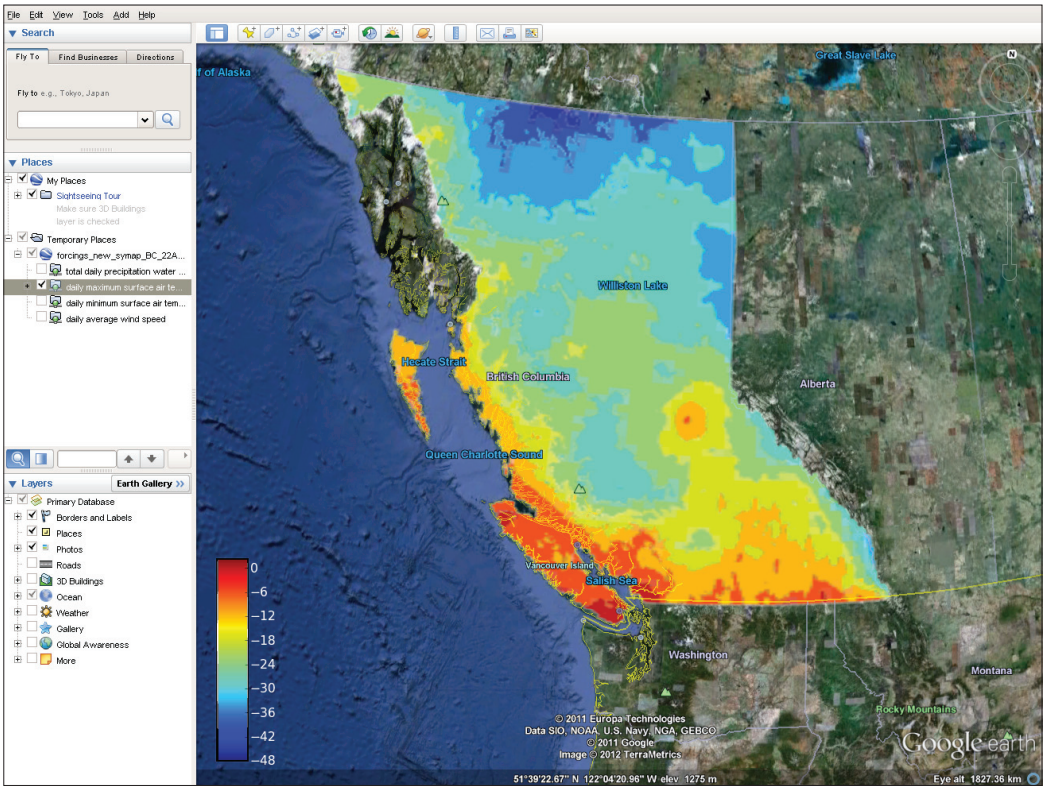
For the CRMP data, the data portal user interface will include a station selection component which consists of a map-based web application that will allow users to choose among a flexible array of options, including the date range, which climate variables to include and whether they want hourly, daily or monthly time series data. The user will also be able to select stations of interest by drawing a polygon around only a select group of stations. The user interface consists of a number of map overlays that give a visual representation of the chosen climate stations and allows users to zoom in to their specific area of interest or take in the entire province at a glance. Once the data has been selected, flexible export options will allow the user to receive data in formats compatible with a range of analysis tools such as Google Earth, Excel, or ncview.

"Essentially what we've done is tap into a data stream that already existed and made it more valuable to users," said PCIC Lead of Computational Support, James Hiebert, "and we're doing this in a way that leverages open source software to reduce development time while increasing interoperability (with other tools)."

The public launch of a beta version of the PCIC Data Portal is expected in early April 2012.



Tabular view of the PCIC Data Portal showing available datasets for download.



Screenshot showing average daily maximum temperature for all of British Columbia, part of the Hydrologic Impacts Program's gridded meteorological data for BC. Shown here is what the data looks like after GoogleEarth has imported it from the PCIC Data Portal as a Web Mapping Service (WMS) layer, one of several flexible formats the data portal supports.

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on regional climate service delivery for submission to a peer-reviewed publication in early spring 2012.

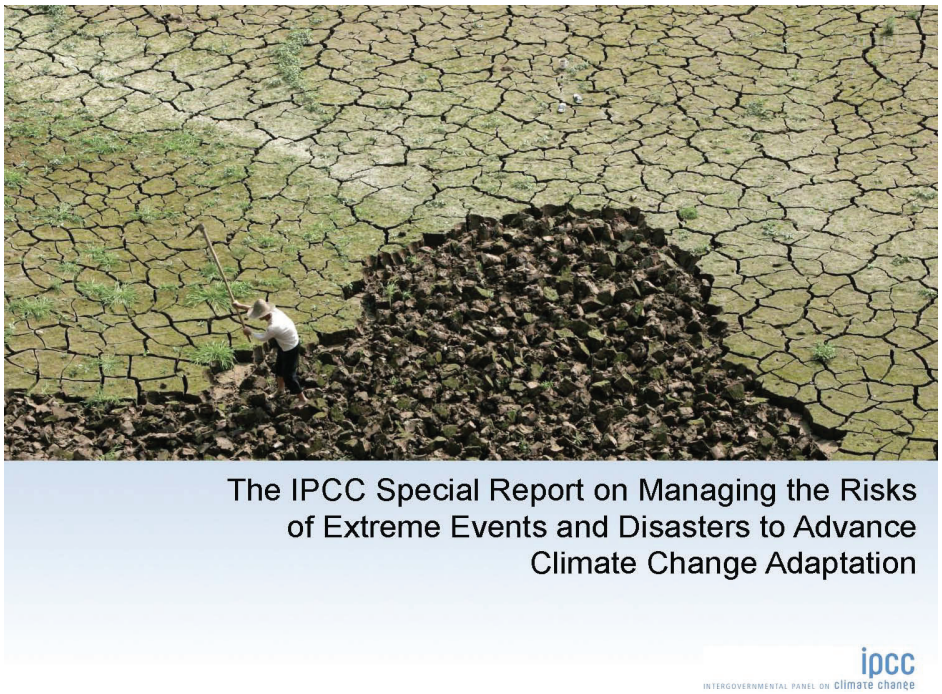
From the writing groups came insights into the challenges of communicating climate science information, even to the most receptive audiences. Participants described the importance of separating 'science questions from policy questions' and the importance of an open and iterative dialogue between regional climate service providers and stakeholders.

The workshop was jointly organized by PCIC in partnership with the Institute for Coastal Research, Helmholtz-Zentrum Geesthacht (HZG) in Germany. Co-sponsors included the Pacific Institute for Climate Solutions, the University of Victoria and KlimaCampus Hamburg.

For more information, including access to speakers' slides, visit the PCIC website at http://pacificclimate.org/news-and-events/regional-climate-services-workshop-2011.

IPCC SREX Summary for Policymakers Released

In advance of the publication of its Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) the Intergovernmental Panel on Climate Change (IPCC) released the SREX Summary for Policymakers on November 18, 2011.



Cover photo and title slide from the presentation provided at http://ipcc-wg2.gov/SREX/ which provides an overview of the upcoming SREX publication. (Source: IPCC WG2)

The summary document and the full report on which it is based represent the first attempt in the history of the IPCC to produce an assessment that spans such a broad range of disciplines. It brings together physical scientists, vulnerability, impacts and adaptation researchers, and members of the disaster risk management community, many of whom have not previously been involved in the work of the IPCC.

"While that marriage wasn't easy, I think it has borne fruit," said PCIC Director and IPCC Bureau Member Francis Zwiers, a contribution author of the report, "and done so in the context of the most worrisome aspects of climate change—the expectation that a changing climate will affect the frequency and intensity of climate extremes."

Speaking of the chapter in the report that deals with observed and projected changes in climate and weather extremes, Zwiers noted that another element that makes the SREX report unique is the sheer scope of information about extremes that it has assessed: the reference list alone spans 45 pages and reflects primarily new literature published since the 2007 Fourth Assessment Report.
"It (SREX) represents a very careful and even-handed assessment of the state of the science. There is a strong body of evidence that human influence is affecting extremes in temperature, though evidence of an impact on other types of extremes such as precipitation remains relatively more tenuous," said Zwiers.

Some highlights of the summary report include:

- Changes in some types of extreme weather and climate events have already been observed in some parts of the world and further changes are projected over the span of this century.
- Socioeconomic development, natural climate variations, and human-induced climate change all have an influence on climate- and weather-related disaster risk.
- Experience with disaster risk management and climate change adaptation can inform effective approaches to prepare for and respond to extreme events and disasters.

The Summary for Policymakers was approved by IPCC member governments during the international body's recent meetings in Kampala, Uganda and is now available from the IPCC SREX website at http://ipcc-wg2.gov/SREX/. Release of the full report on extremes is expected in February 2012.

OTHER EVENTS

PCIC at the WCRP Open Science Conference

Possible links between climate change and extreme weather events was one of the major topics of discussion at the World Climate Research Programme's Open Science Conference held in Denver, Colorado October 24-28, 2011.

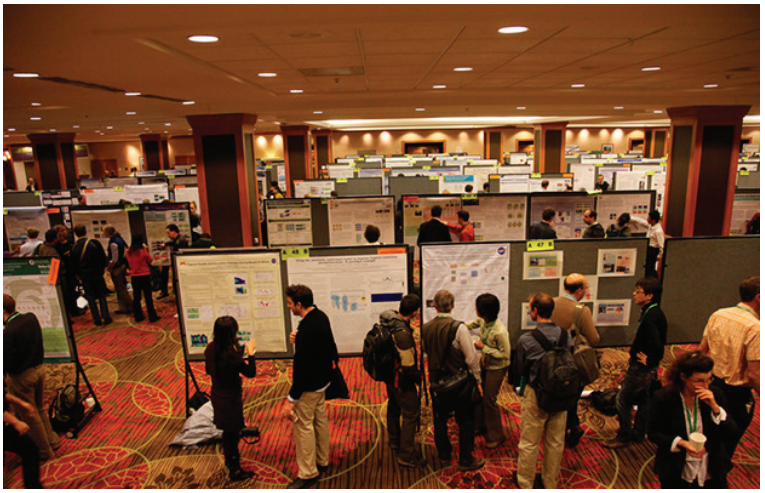
Titled "Climate Research in Service to Society", the conference brought together scientists from over 70 countries to discuss the latest climate research and identify emerging and pressing scientific questions and challenges. Among the major topics of discussion was the possible link between climate change and extreme weather events, including the extent of human influence on the frequency of occurrence for extreme climate and weather.

PCIC Director Francis Zwiers led a team of convenors to organize one of the conference's Parallel Sessions: "Detecting, Understanding and Predicting Extreme Climate Events" and presented a poster "Understanding and Characterizing Past, Present and Future Climate Extremes through Observations and Model Simulations".

PCIC Hydrologist Arelia Werner also presented a poster titled "Water Resources and the Hydrological Cycle over Land" and acted as a rapporteur, assisting in the preparation of written summaries on the key messages emerging from the various sessions as input into the conference's concluding panel discussion.

The final plenary session was devoted to a discussion on the future of the WCRP and introduced a number of community discussion papers intended to stimulate dialogue and development in this area. Among them was a community paper co-authored by Zwiers and several other prominent climate scientists, titled "Community Paper on Climate Extremes: Challenges in Estimating and Understanding Recent Changes in the Frequency and Intensity of Extreme Climate and Weather Events." This discussion paper is available online at http://pacificclimate.org/publications.

The WCRP is sponsored by the World Meteorological Organization, the International Council for Science, and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO).



Poster session at the WCRP Open Science Conference in Denver, Colorado October 24-28, 2011. (Source: WCRP photo gallery at http://www.ucar.edu/communications/slideshows/WCRP-conference/)

PCIC Participates in AGU Fall Meeting 2011

PCIC staff members were among the nearly 20,000 geophysical scientists, educators, students and policymakers who attended the annual fall meeting of the American Geophysical Union (AGU) in San Francisco, California December 5-9, 2011.

Regional Climate Impacts Lead Trevor Murdock was invited to present results from three recent projects in BC in collaboration with BC Ministry of Transportation and Infrastructure, Engineers Canada, City of Castlegar, and Columbia Basin Trust. In each of these projects, regional climate modelling results from the North American Regional Climate Change Assessment Program (NARCCAP) were used to investigate projections of temperature and precipitation extremes in the 2050s. The presentation focused on results that indicate considerable increases in warm temperature extremes in the Columbia Basin. A PCIC report summarizing the results is currently undergoing peer review.

Hydrologic Impacts Lead Markus Schnorbus presented a poster titled "Impact of Projected Climate Change within Two Hydrologic Regimes in British Columbia, Canada" describing results from PCIC's four-year hydrologic impacts study with BC Hydro comparing projected changes in the Peace and Campbell River watersheds for the 2050s.

Regional Climate Impacts Analyst Stephen Sobie presented "Regional Projections of Climate Change Using an Earth System Model of Intermediate Complexity", a poster reviewing recent work aimed at evaluating the effectiveness of the UVIC Earth System Model for simulating regional climate system response to increasing greenhouse gas emissions.

The AGU Fall Meeting is the largest worldwide conference of its kind and provides a showcase of current scientific theory in the geophysical sciences through numerous oral and posters sessions, lectures, exhibits, town hall meetings and other social events.

OTHER NEWS

New Research Climatologist Joins PCIC

PCIC welcomes Dr. Alex Cannon who has joined PCIC as a Research Climatologist to work alongside the consortium's scientific and technical staff in the development of new tools and methodology for predicting climate extremes on seasonal and decadal time scales.

Alex holds a PhD in Atmospheric Science and an MSc in Climatology from the University of British Columbia (UBC). Prior to joining PCIC, he was Senior Hydroclimatologist with the Meteorological Service of Canada at Environment Canada – Pacific and Yukon Region. He has authored more than 40 articles in refereed journals and serves on the Editorial Boards of Computers and Geosciences, PLoS ONE, and ISRN Meteorology. Alex is also a member of the American Meteorological Society Committee on Artificial Intelligence Applications in Environmental Science and is currently an Adjunct Professor in the Department of Earth and Ocean Sciences at UBC. Alex received the Canadian Meteorological and Oceanographic Society's Tertia M.C. Hughes Memorial Prize in 2008 and the World Meteorological Association's Research Award for Young Scientists in 2009.

New Administrative Assistant Joins PCIC

PCIC welcomes Shelley Ma, its new Administrative Assistant who will be providing administrative support to the Director and also the Lead, Planning and Operations, working closely with the latter to facilitate day-to-day administrative functions at the consortium.

Her prior work experience includes positions at the University of Victoria's Department of Political Science and Department of Curriculum and Instruction as well as the BC Ministry of Labour, Citizens' Services and Open Government. Shelley also spent five years as a Program Officer and Student Advisor at two universities in the People's Republic of China. She holds an MEd in Curriculum and Instruction from the University of Victoria, a BA in English Language and Literature Studies from Sichuan International Studies University and a Diploma in Business Administration, also from the University of Victoria.

Philippine Delegation Meets with PCIC and PICS

In December, PCIC and the Pacific Institute for Climate Solutions (PICS) hosted a delegation from the Philippine Local Government Academy interested in learning more about Canadian approaches to climate change adaptation policy and program development.

The visit to PCIC/PICS offices at the University of Victoria was part of a province-wide tour by representatives from several Philippine municipalities and included visits to select BC communities and provincial government agencies. The tour was supported by the Institute of Public Administration in Canada Democratic Governance Program and the Canadian International Development Agency.

While at the University of Victoria the delegates heard from PCIC and PICS on the two organization's complementary approaches to providing climate information to municipalities and other regional climate stakeholders. During their visit, members of the delegation noted that its geography and dense population make the Philippines particularly vulnerable to the impacts of climate change and variability. Hence, they expressed a keen interest in learning about different approaches to adaptation planning at the local and regional level.

*Thank you for your continued interest in the **Pacific Climate Impacts Consortium**, a regional climate service centre at the University of Victoria providing practical information on the physical impacts of climate variability and change in the Pacific and Yukon Region of Canada. We are committed to working with climate researchers and regional stakeholders to produce knowledge and tools in support of long-term planning and adaptation.*

*Visit **http://pacificclimate.org** for free online access to PCIC resources.*