PACIFIC CLIMATE IMPACTS CONSORTIUM

PCIC UPDATE

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PCIC and PICS Share New Home

PCIC and PICS offices at University House 1, University of Victoria.

After many months of planning and construction, PCIC and Pacific Institute for Climate Solutions (PICS) moved to new offices on June 6.

Both organizations are now headquartered in University House 1 (formerly Alumni House), which is located on the northeast corner of the University of Victoria campus above Cadboro Bay. The building was once a residence for the University President and has been newly renovated to incorporate energy efficiency features such as heat pump, LED lighting and conservation-minded plumbing fixtures throughout.

Previously, both organizations were housed with several other campus groups in the Sedgewick C Building on the other side of campus. However, it was evident as far back as 2008 that PCIC and PICS would outgrow that building's available office space so planning for new office space was initiated at that time.

With PCIC full-time staff now numbering 17 and the need for additional workspace to accommodate temporary students and research assistants working on special projects, the move comes at an opportune time. In addition to providing current and near-future space requirements, the new arrangement also provides PCIC and PICS with even more opportunities to work closely together on climate-related projects of mutual interest.

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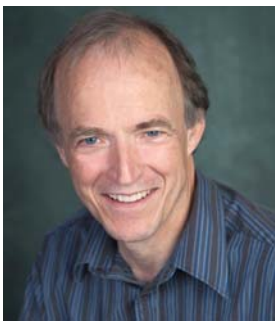
PERSPECTIVE: Message from the Director



There is an increasing body of scientific research, using both observations and Earth system models of a range of complexities, pointing to the essential irreversibility of human-induced global warming, at least on multi-generational human time scales. This implies that we will have no choice but to adapt to the climate change that has already occurred and will inevitably continue to occur as a consequence of the continued emission of greenhouse gases into the atmosphere, and as a consequence of the warming that is already "in the pipe", but which has not yet been realized. This is not to say that mitigation is not required. Indeed, it is very clear that we need to *both* reduce emissions (in order to reduce the rate of climate change and determine the eventual warming to which we will be subjected) *and* adapt to the changes taking place. Further, it is also clear that the impacts of the changing climate will be felt most strongly through changes in the frequency and intensity of extreme climate and weather events. A substantial part of the focus of adaptation will therefore be on extremes, including droughts, floods, extreme hot temperatures, a lack of extreme cold temperatures and extreme winds – all of which have detrimental impacts.

There is an unprecedented and expanding interest in climate and weather extremes that is resulting in demands for information that currently outstrip the capacity of science to respond authoritatively. In the attempt to meet this need, there is intense activity both in climate science and in other areas such as in statistical science to improve our understanding of extremes.

While definitive results are still few and far between, there is a slowly accumulating body of evidence indicating that human influence on the climate is having an impact on extremes. Nevertheless, a great deal of caution is needed when interpreting the high-impact climate and weather events that so frequently make the news. While rare, 100-year extreme events happen almost continually somewhere on the planet, and would do so even in an unperturbed climate. Furthermore, the impact of rare events can be, and often is, magnified by human activities that affect physical and biological systems in ways other than through climate change. Research on event attribution, which aims to determine whether human influence on the climate has changed the odds of a given observed extreme weather or climate event occurring, is only just beginning. Results published to-date show that while some prominent events, such as the European heatwave of 2003, were probably made more likely by human influence on the climate, other similar events, such as the Russian heatwave of 2010, might have been of entirely natural origin.

PCIC aims to contribute to developing a body of knowledge in British Columbia. The PCIC effort to assess statistical downscaling tools from the perspective of climate extremes (see Project Focus, p. 3) is an important part of that effort, with direct relevance to climate stakeholders in BC and elsewhere.

Project Focus: Downscaling Intercomparison Project

Meeting the need for practical local-scale climate information is a key challenge for climate scientists working from large-scale global climate models (GCMs). GCMs typically simulate values for temperature and precipitation as averages over fairly large spatial areas, leaving analysts guessing about potentially important local variations within those areas. Such local-scale information is required to understand the possible impacts of climate variability and change on climate extremes.

To bridge the gap between global scale GCM output and local scale impacts, climate scientists have developed a number of 'downscaling' techniques, using either regional climate models or various statistical methods. A large number of statistical downscaling approaches are available, requiring guidance on which method is most appropriate for a particular application and locale.

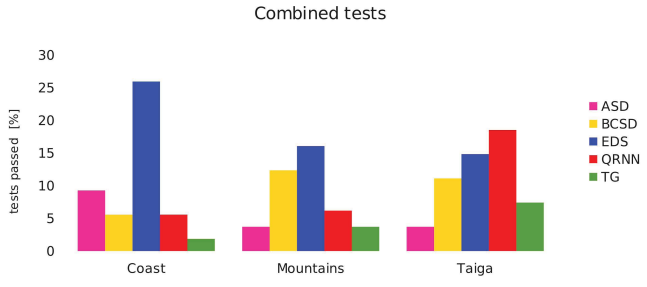
PCIC's Downscaling Intercomparison Project aims to provide a rigorous evaluation of the comparative strengths and weaknesses of several popular statistical methods of downscaling climate extremes. Initially, five methods were compared: Automated Statistical Downscaling (ASD), Bias-Corrected Spatial Disaggregation (BCSD), Expanded Downscaling (EDS), Quantile Regression Neural Networks (QRNN) and TreeGen (TG). These techniques were tested for their ability to represent local climate extremes in British Columbia, a region that presents a significant challenge for downscaling due to its widely varying topography. The performance of the various techniques is being assessed through the use of the so-called Climdex indices, a set of 27 climate indicators used by the World Meteorological Organization for measuring climate extremes.

Temperature and precipitation data from seven meteorological stations in three different climate zones of British Columbia were used to determine values and distribution for each index. Three statistical tests were applied for each combination of downscaling method and index in order to ascertain the method's ability to reproduce the distribution of each index.

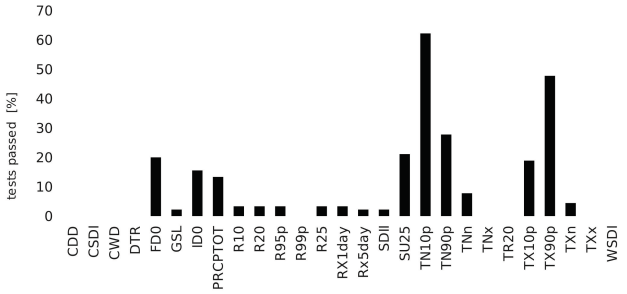
Initial results appear to favour EDS overall as the most reliable method of the five downscaling techniques for representing climate extreme indices in the study areas. However, individual test results vary widely by region and by index.

"We are facing a real challenge here by bringing together five pretty advanced downscaling techniques and streamlining them for the tests to make use of all the terabytes of global and local climate data in a consistent way," said Project Lead Gerd Bürger, "It is fortunate that we have the necessary expertise assembled here at PCIC."

These results are being submitted for publication in a peer reviewed scientific journal. Additional downscaling methods and study areas are planned for inclusion in the project's final report, expected in December 2011.



Graph showing the percentage of tests passed for each of the five statistical downscaling methods, across all 27 Climdex indices and grouped by major climate region. EDS appears to have performed best overall, and overwhelmingly so on the BC coast, though QRNN performed better in the northern taiga region of the province.



Graph showing the percentage of tests passed across all five statistical downscaling methods and study areas for each of the 27 Climdex indices for representing climate extremes. For detailed definitions of each index see http://cccma.seos.uvic.ca/ETCCDI/list_27_indices.shtml.

PCIC Scientists Present at CMOS

PCIC was well-represented at this year's annual meeting of the Canadian Meteorological and Oceanographic Society (CMOS), sharing the results of their work with colleagues in the climate-related science community.

CMOS Congress 2011: Ocean, Atmosphere and the Changing Pacific was held in Victoria, BC, June 5-9 and featured a wide range of informative sessions in the fields of climate, weather, oceanography and biogeochemistry.

PCIC Director Francis Zwiers presented attendees with an update on the upcoming IPCC Fifth Assessment Report currently underway and expected later this year as well as two other talks: “Quantification of Uncertainty in High Resolution Temperature Scenarios for North America” and “On the Role of Statisticians and the Study of Predictability”.

PCIC's regional climate impacts group presented on the use of regional climate models for analyzing climate extremes in BC, a comparative analysis of different statistical downscaling methodologies and results from its community climate impacts assessment for the Atlin-Taku region of northern BC. Recently completed hydrologic impacts projects concerning the Peace, Upper Columbia and Campbell rivers was the focal point for several presentations by the consortium's hydrologic impacts group.

Highlights: Other Presentations and Meetings

An update on progress towards the compilation of a province-wide inventory of meteorological station data by PCIC's climate analysis and monitoring team was presented by Computational Support Lead James Hiebert at the BC Ministry of Environment on April 13.

In late April, Climatologist Faron Anslow conducted a workshop on downscaling titled “Downscaling Across the Border: a Case Study in the Columbia River Basin” at the University of Alaska Fairbanks. Participants included invitees from several US government departments and agencies, including the National Oceanic and Atmospheric Administration, the US Geological Survey, Department of Fish and Wildlife, and others.

Director Francis Zwiers presented results from his work on the detection and attribution of climate change on climate extremes at the University of Bern in Switzerland as part of a visit to the IPCC Working Group 1 Technical Support Unit. In June, Zwiers presented this year's I. I. Glass Memorial Lecture at the University of Toronto Institute for Aerospace Studies. The institute is increasingly interested in exploring ways of reducing the climate impact of aviation and wanted students to benefit from a lecture on the topic.

Hydrologist Rajesh Shrestha presented “Modelling Climate Change Impacts on the Hydrologic Regime in the Fraser Watershed, British Columbia” while representing PCIC at the annual meeting of the Canadian Geophysical Union (CGU) in Banff, Alberta on May 16.

Also in May, Climate Scientist Trevor Murdock presented an overview on climate change in British Columbia to representatives of local governments participating in an adaptation project with ICLEI – Local Governments for Sustainability in Vancouver, BC. ICLEI is an association of over 1,200 local governments spread over 70 countries that provides technical consulting, training and information services in support of local government efforts to implement sustainable development initiatives in their respective communities.

PCIC also played host to the following guest seminars at the University of Victoria:

- **Rick Katz**, National Center for Atmospheric Research, Boulder, CO presented “Statistical Modelling of Hot Spells and Heat Waves” on April 11.
- **Roger Pielke, Jr.**, Environmental Studies Program, University of Colorado presented “The Climate Fix: What Scientists and Politicians Won't Tell You About Global Warming” on April 20. This event was hosted jointly with the Pacific Institute for Climate Solutions as part of the Pacific Climate Seminar Series.
- **Diana M. Allen**, Department of Earth Sciences, Simon Fraser University presented “Groundwater Systems in Mountain Ranges: A Climate Change Perspective” on June 3.
- **Alan F. Hamlet**, Department of Civil and Environmental Engineering, University of Washington presented “Quantifying the Effects of Climate Variability and Change on Hydrologic Extremes in the Pacific Northwest” on June 17.

Visit the PCIC events calendar at http://pacificclimate.org/calendar for information on past and upcoming seminars and events.

Preparing for the Climate Challenge: PICS Annual Forum 2011

PCIC was pleased to participate in the Pacific Institute for Climate Solutions' third annual forum, “Resilient Communities: Preparing for the Climate Challenge”, held in Vancouver, BC, June 14-15.

The event attracted scientists, planners and decision-makers interested in the latest climate change projections for British Columbia and exchanging information about best adaptation practices and available resources. This year's PICS forum held particular appeal for PCIC due to its emphasis on climate adaptation preparation, an important and growing concern for both organizations as well as other climate stakeholder groups.

PCIC Director Francis Zwiers provided a keynote overview of the scientific basis for the challenges facing society in the midst of rapid climate change, making the point that efforts to curb greenhouse gas emissions, while necessary, are not sufficient for meeting the threat. Societal adaptation to the changes already underway must also be made.

Other forum speakers provided examples of how some communities and sectors, including cities such as Vancouver and Toronto and heavily affected economic sectors like agriculture, are including climate adaptation in their operational planning.

PCIC also had the opportunity to host a table at the forum aimed at providing a way for the consortium to meet directly with forum participants interested in gaining direct access to its practical knowledge on the physical science behind climate variability and change. Participants were encouraged to check out PCIC online tools like Plan2Adapt and its selection of published research reports available at http://pacificclimate.org/resources.

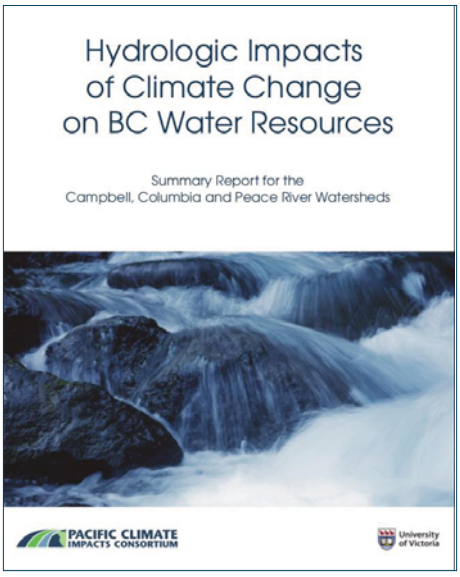
Finally, PCIC involvement in the forum demonstrated a valuable synergy between the consortium and its partner PICS, with the former providing scientific information in support of the latter's policy and planning objectives.

Hydro Impacts Summary Report Published

PCIC has just published “Hydrologic Impacts of Climate Change on BC Water Resources: Summary Report for the Campbell, Columbia and Peace River Watersheds”.

This summary report outlines the major climate and hydrologic modelling results from the consortium's recently completed four-year collaborative research work with BC Hydro. Intended as a complement to the more detailed peer-reviewed technical reports published by PCIC in April 2011, the summary report places the projects' technical results in the context of policy and planning. Its publication underlines PCIC's ongoing commitment to ensuring the results from its applied research programs are both relevant and accessible to a wide range of climate stakeholders.

Electronic versions of the summary report as well as the project reports on which it is based can be downloaded from the PCIC website at http://pacificclimate.org/resources/publications.



Thank you for your continued interest in the Pacific Climate Impacts Consortium. We are committed to maintaining PCIC as a stakeholder-driven consortium, rooted in the academic research community, yet looking outward. Hence, we welcome and value feedback from researchers and stakeholders either through our online contact form at http://pacificclimate.org/contact, via email at climate@uvic.ca, or telephone (250) 721-6236.