2015-2016: A YEAR IN 15 STORIES

PACIFIC CLIMATE IMPACTS CONSORTIUM

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REGIONAL CLIMATE SERVICES

REGIONAL CLIMATE SERVICES

The Pacific Climate Impacts Consortium

The Pacific Climate Impacts Consortium is a regional climate service centre that bridges the gap between climate science and the needs of stakeholders in the British Columbia and Yukon region. PCIC provides accessible, credible information to these stakeholders about past and future climate conditions for their regions and what these changes might mean. This supports decision makers in BC as they develop plans and policies that account for and minimize the risks that they face due to the changing climate. To do this, PCIC performs a variety of functions, including: compiling and providing quality-controlled data; downscaling the output of global climate models; performing hydrologic modelling; translating current research findings; providing interpretation of technical climate science data for decision makers; and performing applied research in a variety of areas.

To deliver these climate services, PCIC collaborates with regional users and works closely with other national and international organizations that have complementary missions. This includes multiple research institutions and other regional climate science providers, with whom we share and review the latest research results and techniques for honing and interpreting climate projections. These organizations include user groups here in British Columbia, such as BC Hydro, BC Ministries, professional organizations, and local governments. Collaborating with these groups allows for two-way learning and the development of products that best suit the needs of our regional stakeholders.

PCIC's applied research program is organized into three interrelated themes that address different aspects of climate change. These are supported by a Computational Support Group and an Administration and Communications team. Our Climate Analysis and Monitoring Theme meets the need for data that describe the climates of the past and the present day, maintaining and making available high-quality observational data sets and developing new data sets using the latest cutting-edge tools. Our Regional Climate Impacts Theme meets the need for the analysis and interpretation of future changes to long-term averages of temperature and precipitation, as well as climate variability. The theme makes extensive use of global climate model output and statistical downscaling methods, as well as the statistical analysis of extreme events. Our Hydrologic Impacts Theme uses climate data and physics-based models to determine how climate change may affect BC's water resources. Our Computational Support Group supports these themes and electronic climate service delivery, including a variety of tools for our users to explore and download data and climate projections. Our Administration and Communications team keeps PCIC running smoothly, provides information to our stakeholders about PCIC's activities and performs some interpretation of scientific results for our users.

CORPORATE OVERVIEW

CORPORATE OVERVIEW

Message from PCIC's Corporate Leadership

It is extremely gratifying to see continued growth and maturation of both PCIC and the community of stakeholders in BC and beyond that it serves. The continued development of the services that PCIC provides and increasing capability of the stakeholder community to effectively utilize PCIC's services expertise augers well for planning and adaptation efforts within the region.

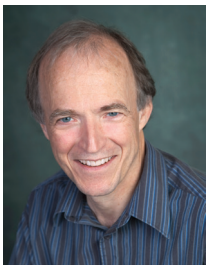
PCIC's 2015-2016 achievements and impacts are the result of collaboration and strong partnerships. PCIC works very closely with its users and stakeholders, with many projects now user-commissioned and user-lead. This year's activities advanced our understanding of climate impacts in a variety of sectoral and regional contexts. Highlight achievements in this report include new scenarios of future variability, change and extremes for several regions in British Columbia, projections of hydrologic impacts due to climate change including future streamflow extremes, maintenance of and improvements to the Provincial Climate Data Set, new very high spatial resolution climatological maps, and the development of user tools including climate tools for British Columbia's engineering community. In addition, PCIC scientists had a high level of peer-reviewed research productivity.

With its growing list of partners and user-lead projects, the extensive use of its data portal and tools, and through its applied climate research program, PCIC continues to expand its reach and impact, to provide its users with an array of quantitative climate information for planning and decision-making in the context of a changing climate.

On behalf of PCIC, its Board of Directors and the Program Advisory Committee, we thank the University of Victoria and all of PCIC's valued partners for their support and commitment and look forward to continuing to work together.

Dr. David Castle
Chair, Board of Directors

Thomas White
Chair, Program Advisory Committee



Dr. Francis Zwiers
PCIC Director

CORPORATE OVERVIEW

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Our Partners

Association of Professional Engineers and Geoscientists of BC
BC Hydro
BC Ministry of Agriculture
BC Ministry of Health
BC Ministry of Community Development
BC Agriculture and Food Climate Action Initiative
BC Agricultural Research & Development Corporation
BC Ministry of Environment, Climate Action Secretariat
BC Ministry of Environment, Environmental Monitoring, Reporting and Economics
BC Ministry of Forests, Lands and Natural Resources Operations
BC Ministry of Transportation and Infrastructure
Bonneville Power Administration
Capital Regional District
Canadian Centre for Climate Modelling and Analysis
Canadian Network for Regional Climate and Weather Processes (CNRCWP)
Canadian Sea Ice and Snow Evolution Network (CanSISE)
City of Vancouver
City of Victoria
Columbia Basin Trust
Compute Canada
District of North Vancouver
Environment and Climate Change Canada
Fisheries and Oceans Canada
Fraser Basin Council
Great Northern Landscape Conservation Council
Metro Vancouver
Marine Environmental Observation Prediction and Response Network (MEOPAR)
National Oceanic and Atmospheric Administration (NOAA)
Natural Resources Canada
North Pacific Landscape Conservation Council
Okanagan Basin Water Board
Oregon State University, PRISM Climate Group
Ouranos Inc.
Pacific Institute for Climate Solutions
Pacific Salmon Foundation
Resort Municipality of Whistler
Rio Tinto Alcan Inc.
Simon Fraser University
Université du Québec à Montréal
University of British Columbia
University of New Hampshire
University of Northern British Columbia
University of Washington, Climate Impacts Group
University of Victoria
Vancouver Island Health Authority

CORPORATE OVERVIEW

Collaboration

The domains that PCIC operates in and supports are, by their nature, collaborative. For example, PCIC collaborates extensively with the impacts and adaptation planning communities in government and academia. Our researchers actively publish, review and work with other leading experts to further the state of our understanding of the climate and the impacts of climate change and variability, with a focus on hydrology, regional downscaling, the analysis of climate model output and quality control measures for data. This benefits PCIC and the scientific community more broadly, as their work in turn benefits our users. PCIC also works closely with three major research networks, the Marine Environmental Observation, Prediction and Response Network (MEOPAR); the Canadian Sea Ice and Snow Evolution Network (CanSISE) and the Canadian Network for Regional Climate and Weather Processes (CNRCWP). Our overlapping research interests allow us to explore a variety of topics, from the variations in storminess on Canada's coasts, to potential changes in snow cover and water resources in BC, to potential changes in extreme events.

PCIC has also worked with local and regional governments as well as planners and impacts and adaptation researchers since its inception. These collaborations inspire PCIC's researchers to explore new avenues of inquiry and help PCIC to gain a better understanding of the sorts of scientific products that are needed by PCIC's users. In addition, PCIC collaborates with its regional stakeholders in the development of materials for their use. This is useful because it results in materials that are written in the terms used by PCIC's audience, which reduces the need for further summary materials and extends the accessibility and readership of PCIC's research in the communities that PCIC serves.

2015-2016 ACCOMPLISHMENTS AND IMPACTS

2015-2016 ACCOMPLISHMENTS AND IMPACTS

PCIC's Objectives

To provide quality, regionally-focused climate services, PCIC's efforts are centered on three service objectives. These are to provide:

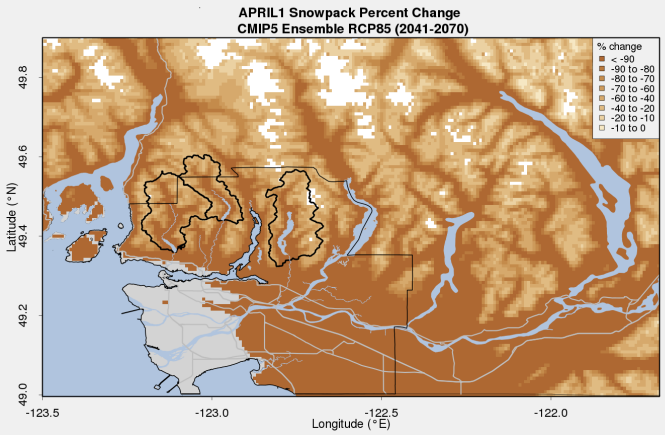
1. Analysis of the impacts of climate variability and change on regional climate and water resources
2. Interpretation of regional climate information specific to user needs
3. Climate data and future climate projections specific to the PCIC study region

PCIC fulfills these objectives by offering a variety of tools and climate information. PCIC meets the first objective through regional analyses, looking at extremes, modelling the hydrology of a region and analyzing the uncertainty of projections and observational data. PCIC meets the second objective by working closely with our users to develop and provide the information they require. PCIC's third objective is achieved through the delivery of information and data in a variety of forms specific to our users' needs, including via PCIC's website, which hosts interactive tools, a range of data portals and an extensive library of reports, peer-reviewed articles and other materials..

The three research themes that comprise PCIC's applied research program: Climate Analysis and Monitoring, Regional Climate Impacts and Hydrologic Impacts, work together with the Computational Support Group to meet PCIC's service objectives.

Local Government Regional Assessments

Planners and policymakers in BC require credible projections of climate change at the scale of the communities that they are developing plans and policies for. To meet this need, PCIC scientists have developed projections of future climate and have assisted in writing climate impacts summaries for the Resort Municipality of Whistler, the District of North Vancouver, the City of Vancouver, and Metro Vancouver Regional District. These summaries were made using a collaborative process, in which PCIC provided the projections to the local governments and jointly undertook writing of the summaries and reports. This results in materials that are, by their nature, tailor-made for the needs and suited to technical expertise and skillsets of their audiences. The reports made use of output from a dozen global climate models driven using a "business as usual" emissions scenario and PCIC's 10 km daily BCCAQ downscaling, as well as elevation corrections to 800 metres spatial resolution to provide projections for the 2050s for each region, relative to a 1971-2000 baseline period with a very high level of spatial detail. These are the first set of assessments to make use of the daily BCCAQ temperature and precipitation downscaling developed at PCIC. Because of the availability of high resolution daily projections, it was also possible to produce snowpack projections. To do so, a simple energy balance snowpack model was implemented. This model accounts for factors such as snow compacting and melting throughout the season, providing a physically realistic representation of snowpack, which is of great concern for regional water supplies and watersheds, as well as for recreation and tourism. All resulting reports and summaries are available online.



Map of snowpack for Metro Vancouver with the watershed boundaries for the regional water supply shown as dark lines. There is a 100% reduction in average snowpack in the lowest lying areas, but this represents only a small change for those locations because they already had very little snow historically. To produce this figure, coarse resolution GCM projections of nighttime low temperature, daytime high temperature, and precipitation are downscaled to a daily time series at 10 km by 10 km resolution and then an elevation correction to very high 800 m by 800 m resolution is performed before the simple energy balance snowpack model is run.

2015-2016 ACCOMPLISHMENTS AND IMPACTS

Working with BC's Engineers

Floods are the most common natural disaster in Canada and major flooding events rank among the costliest disasters in Canadian history. They are a hazard to many communities in BC each year and represent a significant challenge that must be considered in many types of engineering projects. Meltwater-driven spring flows along rivers such as the Fraser can cause flooding, as can extreme precipitation events. Some towns in BC are hit almost yearly by flash floods that are caused by extreme precipitation.

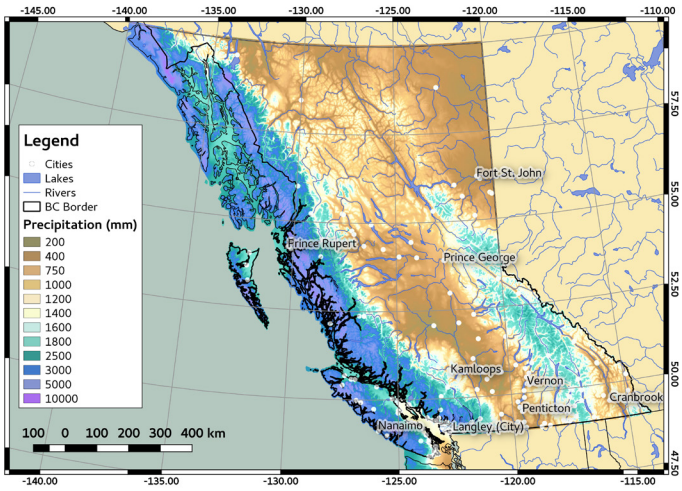
To help planners in BC better prepare for such events, PCIC is working both in science communication and basic research. To communicate the scientific community's current best understanding of extreme precipitation events, PCIC released a Science Brief in December of 2015 that functions as an overview of the topic with commentary about what this means for decision making. PCIC scientists also contributed to the guidelines that have been developed by the Association of Professional Engineers of BC (APEG BC) for taking climate change into account in the design of infrastructure. These guidelines support the Technical Circular (to which PCIC also contributed) that was published in 2015 by the BC Ministry of Transportation and Infrastructure, which requires all work done for the Ministry to consider climate change impacts.

A key engineering requirement is to have reliable estimates of the frequency and intensity of extreme precipitation, both for our current climate and for the future climate. Engineers require this information for a variety of accumulation periods, ranging from minutes to days, and for a variety of return periods ranging from relatively common events (e.g., the largest 10-minute rainfall likely to occur every 5 years on average), to very rare once in a hundred year events. PCIC post-docs and research affiliates are currently looking into the feasibility of providing future projections of sub-daily precipitation extremes from climate models. They are working to understand what the skill and the limitations of the currently available models are for this purpose.

PRISM Climatological Maps

Planners in British Columbia need high-resolution maps of the historical climate, but the topography of British Columbia is complex, which makes producing such maps difficult. PCIC has spent several years collaborating with researchers from Oregon State University to develop such maps, using an interpolation model that they developed, called the Parameter-elevation Relationships on Independent Slopes Model (PRISM). This model is capable of accounting for the effects of BC's complex terrain and has been tested and used around the world. In fall 2015, the PRISM climate maps for the 1981–2010 period were made available on PCIC's PRISM data portal. These maps are 30-year averages at a roughly 800 metre resolution and supplement maps offered earlier by PCIC for the 1971–2000 period.

To increase the utility and scientific rigor of the PRISM data, the Climate Analysis and Monitoring Theme is now undertaking a project to assess the uncertainty of the maps, which is expected to be larger in areas with fewer observations. The production of the new maps was supported, in part, by the Bonneville Power Administration and the National Oceanic and Atmospheric Administration.



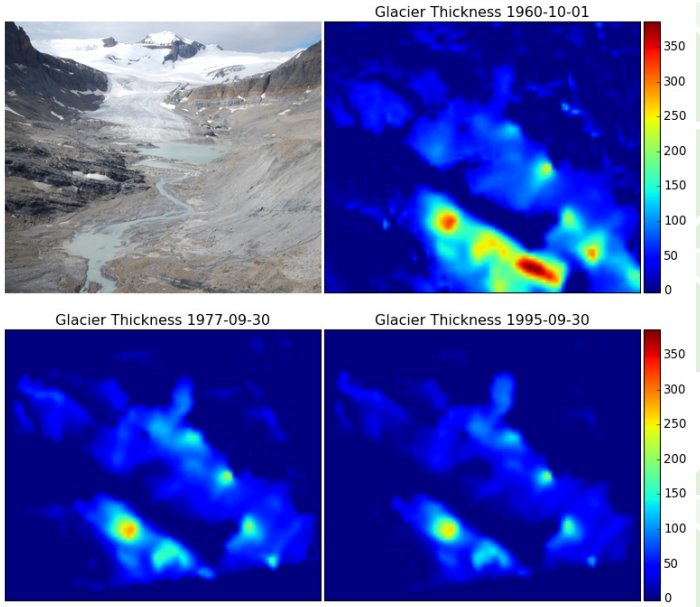
This figure shows a map of the total annual precipitation over the 1981-2010 climate normal period and shows the highly variable climate conditions across BC, from the extremely wet coastal regions to the much drier interior which receives as little as one-50th the precipitation amount.

2015-2016 ACCOMPLISHMENTS AND IMPACTS

Hydrologic Model Upgrades

A region's hydrology describes and determines the availability of water resources, the timing and magnitude of streamflow events and the potential for impacts from things such as flooding events in that region. Anthropogenic climate change has had various effects on both global and regional hydrological cycles. The main approach to quantifying the hydrologic impacts of climate change is the use of hydrologic modelling, wherein projections of climate change are transformed into resultant hydrologic changes. PCIC's main tool in this work is the Variable Infiltration Capacity (VIC) model and over time PCIC personnel have become very experienced and proficient with its use. In an effort to provide improved and relevant guidance regarding the potential effects of hydrologic change, PCIC has undertaken a substantial effort in improving VIC to better reflect changing glacier conditions in BC, to address anticipated questions regarding water quality (water temperature in particular) and to improve the overall model parameterization for application in British Columbia.

Upgrading the VIC model to explicitly model glaciers presented a substantial software engineering challenge. This upgrade included a major redesign of the entire VIC base code, the addition of routines to solve glacier mass balance and the coupling of the VIC model to the UBC Regional Glaciation Model (RGM) to simulate glacier dynamics. The upgrade process was also an opportunity to make the model more computationally efficient. This upgrade has been completed and is currently undergoing testing and evaluation. This new capability will allow PCIC researchers to specifically address potential changes in glacier areas in the future, the resultant changes in glacier runoff and the subsequent effects on water resources in British Columbia. We now refer to the upgraded model as VIC-GL.

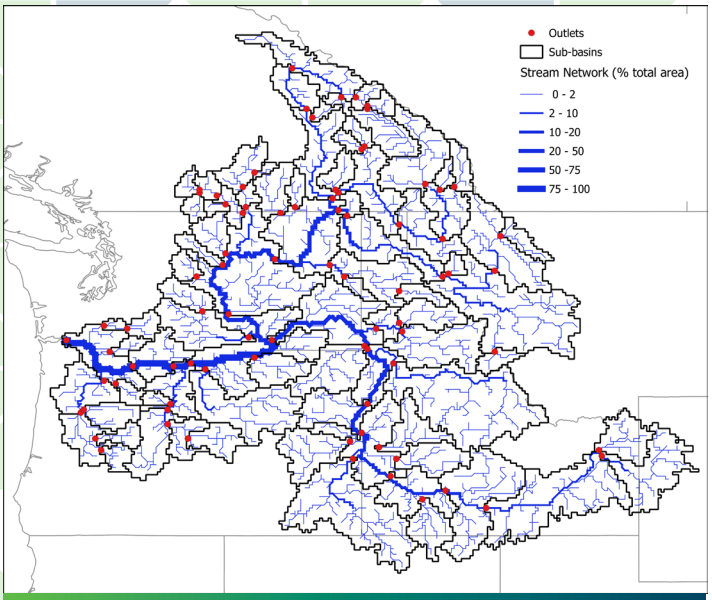


Photograph and sample simulation (uncalibrated) of Peyto glacier in the Rocky Mountains. The top left is a photograph of the glacier, the surrounding terrain and the lake at its base (Changing Cold Regions Network, John Pomeroy). This simulation was made using the coupled VIC-RGM models and shows changes in glacier morphology in terms of glacier thickness (metres) from October 1, 1960 (top right), through September 30, 1977 (bottom middle) and ending at September 30, 1995 (bottom right). The figures show an overall thinning of ice and a loss of glacier area from 1977 to 1995.

The ability to model water temperature is the next big challenge to be undertaken. However, before any water temperature model can be used, it must be tested and evaluated with observed data. PCIC has therefore been collecting, organizing and evaluating water temperature data for British Columbia from numerous sources, as staff resources allow.

The VIC-GL model will be implemented over a substantially larger domain than previously attempted, which necessitated the requirement to completely re-parameterize the model (i.e. update the data used for the soil, vegetation and topography in the model). Although a large undertaking, this task was seen as an opportunity to revisit and improve several critical input and parameter data sets. Improvements include the development of an updated gridded observation forcing data set (temperature and precipitation) for model calibration, the updated model parameterization based on more recent vegetation, soil, and topographic data, the adoption of an updated routing model (RVIC), the integration of updated data formats for model input and output, and the inclusion of additional data types (i.e. evapotranspiration) to constrain the model during the calibration process. This work is now complete.

VIC-GL is expected to become operational over the 2016-2017 fiscal year, and will initially be deployed to update hydrologic projections for the Columbia and key sub-basins of the Fraser.



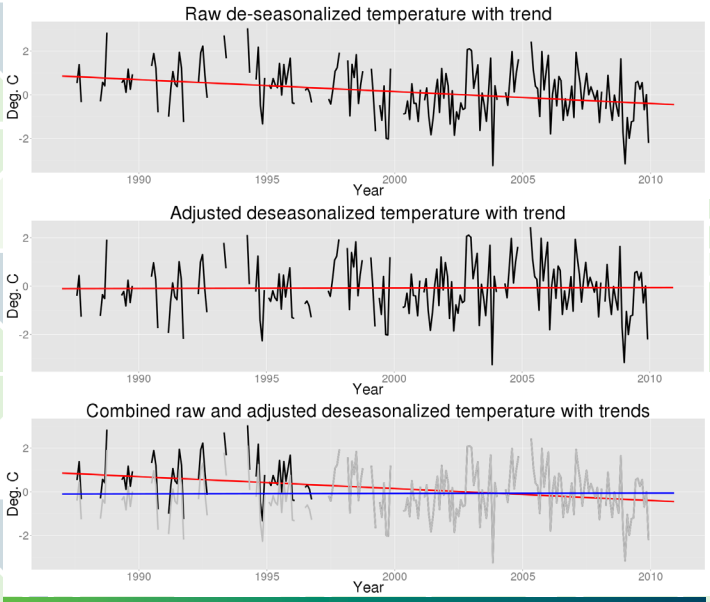
Modelled 1/16-degree streamflow routing network for the Columbia basin study area, using VIC. This shows the sub-division by calibration sites (outlets and sub-basins) and stream network shown as a function of upstream area (as a percentage of total basin area).

2015-2016 ACCOMPLISHMENTS AND IMPACTS

PCDS Quality Control and Homogenization

Observational weather data in the Provincial Climate Data Set (PCDS) can show long-term trends and changes in temperature and precipitation that occur for reasons that have nothing to do with changes in climate. These can arise from changes in station location or the types of instruments used. Such issues with the data are termed 'inhomogeneities' and the process of correcting them is known as 'homogenization.' During the winter and spring of 2015-2016, the Climate Analysis and Monitoring Theme completed a project contracted by the BC Ministry of Environment to apply homogenization techniques to a collection of temperature and precipitation observations from the province. The project focused on two locations: the Campbell River region of Vancouver Island and the Williston Basin region of northeastern BC. These regions contain stations with long records that are potentially useful for monitoring regional climate change. Results show that roughly half of the temperature records from stations analyzed contained inhomogeneities. This effort was also an opportunity for PCIC to assist in the training of a young scientist working on the project. The results of the project were a better understanding of methods needed to homogenize data in the province, an indication of the rate of inhomogeneities in provincial station data and development of methods to automate homogenization to the extent that is possible.

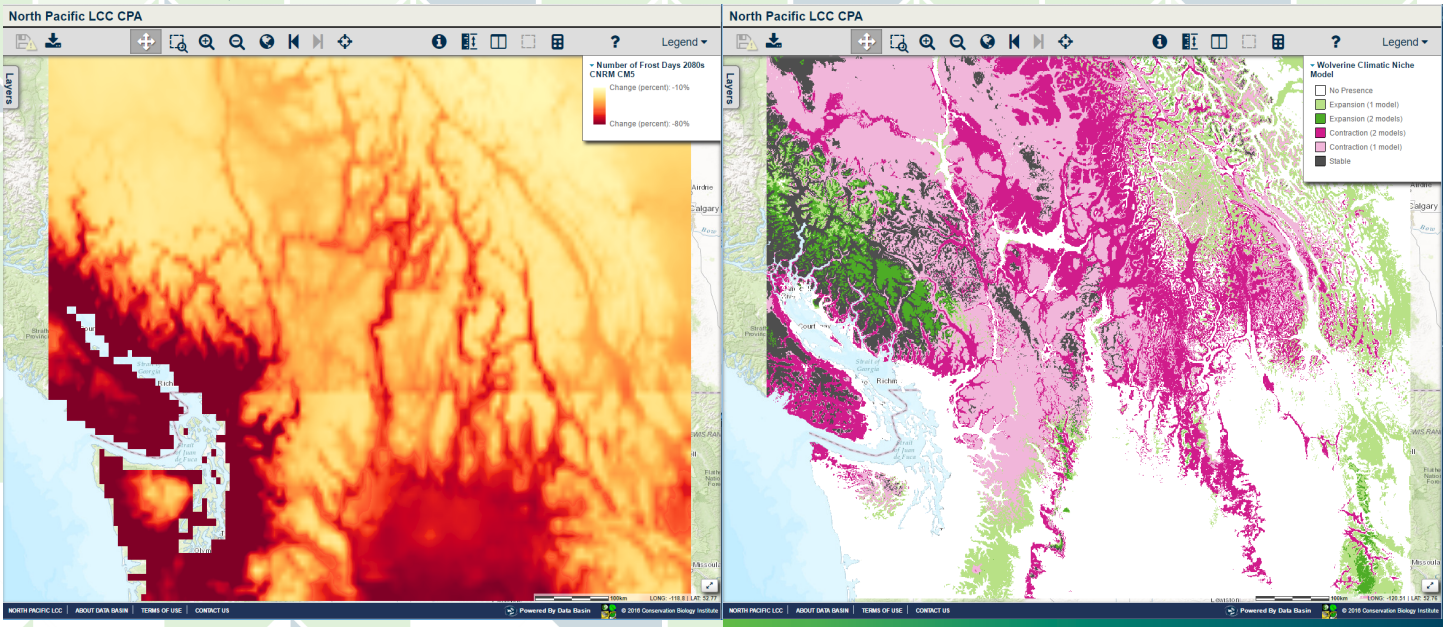
The figure on the right shows an example of this data homogenization process for a station in the Campbell River Basin. Changes were made to the observing network that included this station, which resulted in a false cooling trend. The station was then adjusted using statistical "change point" methods and data from a nearby Environment and Climate Cange Canada station of known quality. The part of the record from 1997 onwards has not be adjusted, so only one trace is visible (bottom panel). The earlier part of the record was adjusted (compare the original with the adjusted). Records are adjusted relative to the most recent data since more is usually known about the recent history of the observing station, such as its siting,management and instruments.



This figure shows the monthly temperature anomalies for a station in the Campbell River basin and seems to exhibit a substantial cooling trend. The top panel is unadjusted. The middle panel, obtained using statistical "change point" detection methods employed when metadata describing the station's history are not available, shows the homogenized record. This shows little trend, if any, over the roughly ~25 year period for which data are available. The bottom panel shows the original (black) and adjusted (grey) figures superimposed on each other.

The homogenized data have been added to PCIC's data holdings and a second, more ambitious, data homogenization project is underway. Both projects have been supported by Environment and Climate Change Canada.

Transboundary Climate Connectivity



Downscaled (BCCAQ) climate data provided by PCIC (left panel; number of frost days in the 2080s from 1 of 12 GCMs downscaled) and the result of analysis using these data for ecosystem impacts, in this case the change in climatic niches for wolverines in the Pacific Northwest (right panel; results from two climatic niche models each driven by a set of downscaled GCMs). From: https://nplcc.databasin.org/.

As the Earth's climate continues to change, plants and animals attempt to adapt by shifting their ranges, moving to stay within climatically suitable areas. On land, this means generally shifting poleward and to higher elevations, where possible. Because climate change is occurring so quickly at present and human infrastructure and settlements can block the adaptive movements of plants and animals, a number of partners in BC and Washington state have initiated the Washington-British Columbia Climate-Connectivity Project to address the issue. The project serves to increase the ability of practitioners to use climate and connectivity models in their planning and policy making, by providing data sets through an online interactive interface, project reports and an overview report. The Pacific Climate Impacts Consortium contributed to the project by working with the University of Washington Climate Impacts Group on synthesising data available to the project across the border, attending meetings to inform stakeholders about projected climate change, providing interpretation to assist with the creation of conceptual species models and review of the final report.

DATA AND INFORMATION DELIVERY

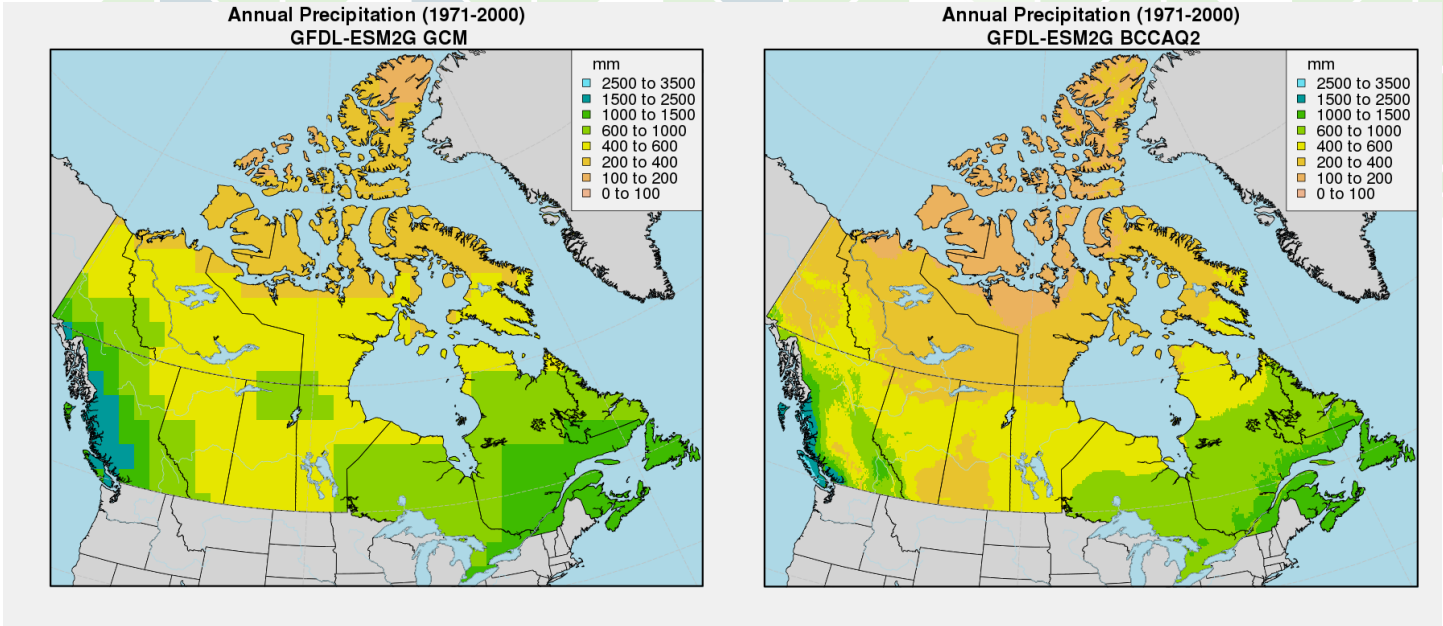
DATA AND INFORMATION DELIVERY

There are two main modes of delivery that PCIC uses to provide services to its users. PCIC works directly with users, developing reports to meet their needs. Recently, this has included collaborating on the development of reports, writing them side by side with users to ensure that they are exactly what is needed to support planning and decision making, and written at a level that is useful to the users' needs. Another approach to service delivery is through the variety of self-help electronic services. These services form core components of PCIC's website and include Analysis Tools, a Data Portal and a Publications Library. The services offered are continually expanded and updated with the most recent data and climate projections that are available.

DATA AND INFORMATION DELIVERY

PCIC Downscaling Method Update

To help communities prepare for projected climate impacts, PCIC must first understand what the projections of global climate models mean at the spatial scales relevant to the communities PCIC serves. Because the resolution of global climate models is generally on the order of a hundred kilometres, raw global climate model output is usually too coarse for this purpose. To derive finer-detailed information from these models, PCIC has developed a statistical downscaling method, Bias Correction/ Constructed Analogues with Quantile mapping reordering (BCCAQ). BCCAQ determines statistical relationships between small-scale and large scale climate using a technique known as quantile mapping to determine future climate projections at the smaller scale. The method used is currently the second version of BCCAQ, which includes procedures to ensure that the quantile mapping avoids inflating projected extremes. This corrects a problem that occurs in many previous statistical downscaling methods. The updated BCCAQ package is configurable, so that it can run on a laptop with a few cores or on the dozens of nodes on one of Compute Canada's supercomputers. PCIC has developed BCCAQ into an open source software package known as ClimDown that is available to the greater research community. The value of BCCAQ can be seen in the figures below, in which the downscaled data captures the strong gradients in climatological precipitation across Vancouver Island, including the narrow dry strip along the south-eastern edge of the island.



Climatological precipitation for the 1971-2000 period as simulated by the GFDL model, and after applying BCCAQ.

New Storage System

As well as encompassing the scientific state-of-the-art in statistical downscaling, ClimDown also demonstrates the application of modern, highly efficient computational approaches. While the original method previously consisted of research-level code, which meant that it consisted of multiple files and steps that had to be run independently by a technician, it is now a single, automated downscaling pipeline. The new software also eliminates the need for intermediary storage, freeing up computational resources for other tasks and is about five-to-eight times faster. It is thus able to achieve the construction of detailed climate change scenarios across very large regions at only a fraction of the computational cost required previously.

The data and model output that is used and generated by climate scientists is often massive, covering vast three-dimensional domains over decades and spanning multiple variables. Being able to work with these enormous quantities of data in a reasonable amount of time requires high-capacity, efficient storage systems. PCIC's Computational Support Group have risen to meet this challenge by building a new, flexible, high-performance storage system. Using GlusterFS technology, this scalable system will allow storage "bricks" to be added effortlessly, expanding PCIC's capacity as the needs of PCIC's scientists and users change. This system will provide PCIC with about 250 Terabytes of disk this year, to support its service delivery and research objectives.

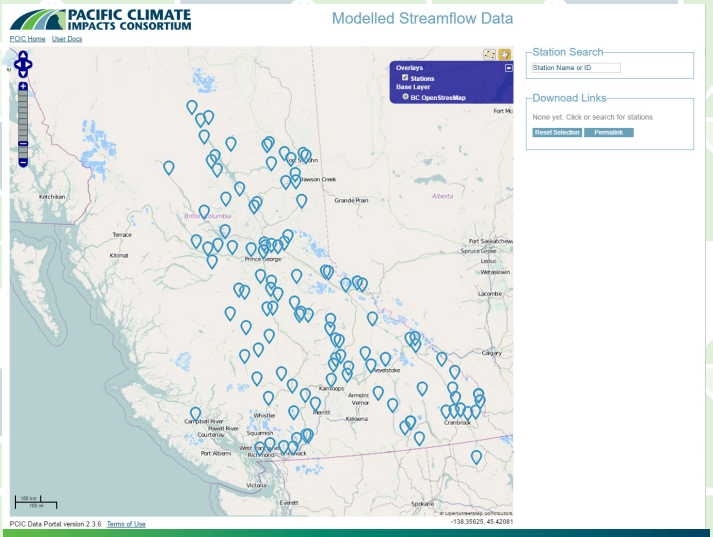
DATA AND INFORMATION DELIVERY

Developing a New Tool for Climate Analysis

PCIC provides a suite of tools for its users to make climate data and analysis readily accessible. PCIC has started to develop a new web tool to add to our available suite for online climate analysis. This tool, named the PCIC Climate Explorer as an interim, internal working name, would have all of the features of, and be a modern replacement for, PCIC's Regional Analysis Tool. It will allow users to download data and maps for regions of interest using an intuitive, point and click map-based interface. The new tool will be able to provide a broader range of data, including data with heterogeneous resolutions in time and space. The data provided will include: GCM output from the fifth phase of the Coupled Model Intercomparison Project (CMIP5), BCCAQ 10 km resolution downscaled data and indices of climate extremes (CLIMDEX) and will make use of the daily time resolution.

Work on this tool also dovetails with a climate tool that PCIC has been developing for BC's engineering community. Working with the BC Ministry of Transportation and Infrastructure, PCIC developed a version of the new climate tool with a customized user interface and data sets that are of use to the province's engineers and contractors.

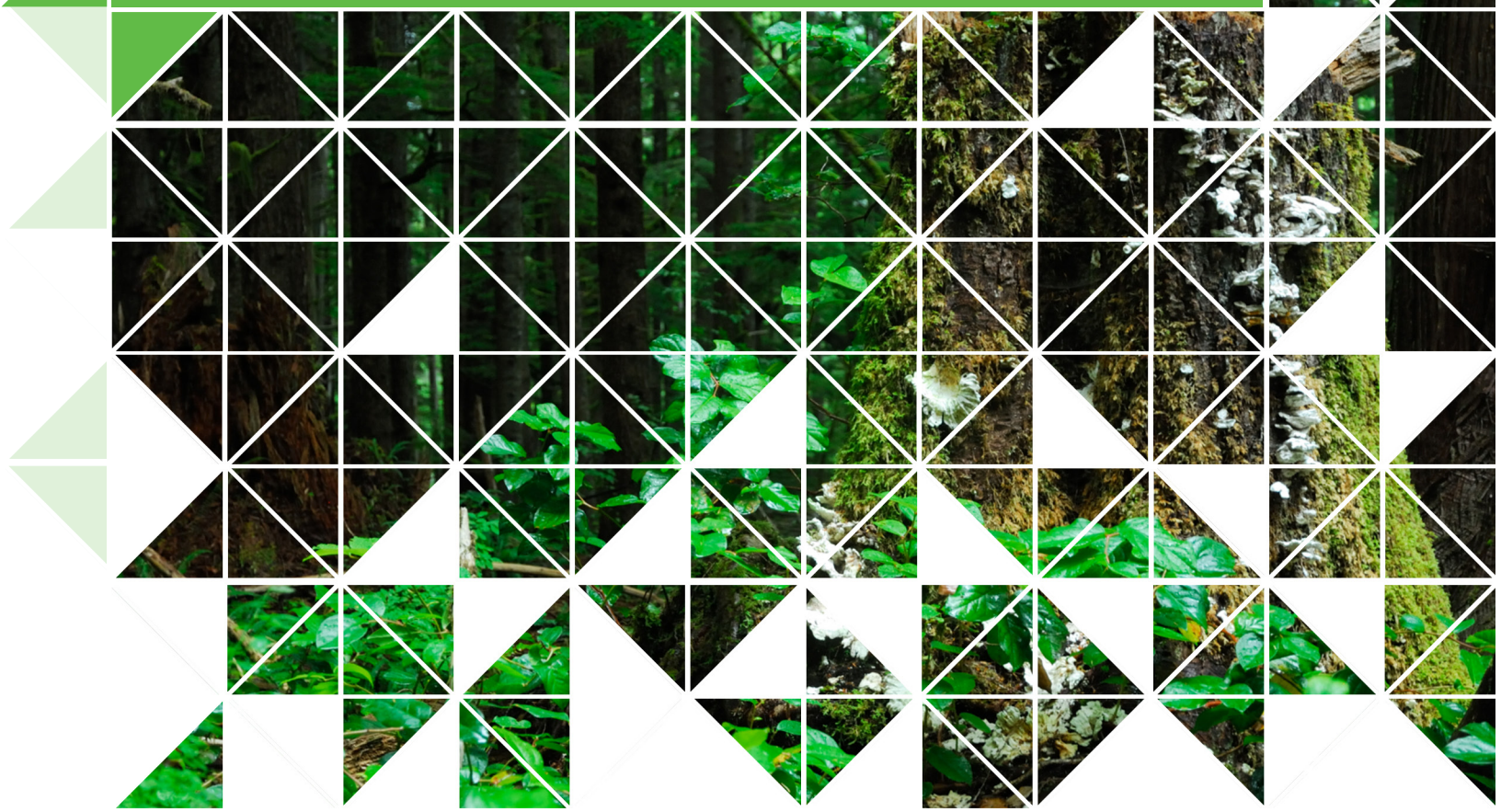
PCIC's Data Portal Continues to Serve



This figure is a screenshot of the Station Hydrologic Model Output Portal Page.

PCIC supports planners and researchers in the regions we serve, in part, by providing various types of data, suitable for different purposes. Our Data Portal page provides several types of station data, high-resolution PRISM climatology, hydrologic model output and statistically downscaled climate scenarios. We continue to add to these options, making the results from our VIC hydrologic model runs and PRISM data for the 1981-2010 period available this year. The Computational Support Goup continues to improve the portal, weeding out bugs and tending to the more than 80,000 download requests and 10 terabytes of data that PCIC delivered to users over 2015-2016.

OPERATIONS AND FINANCE

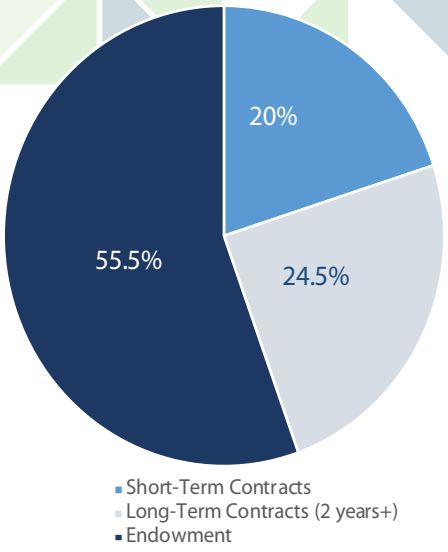


OPERATIONS AND FINANCE

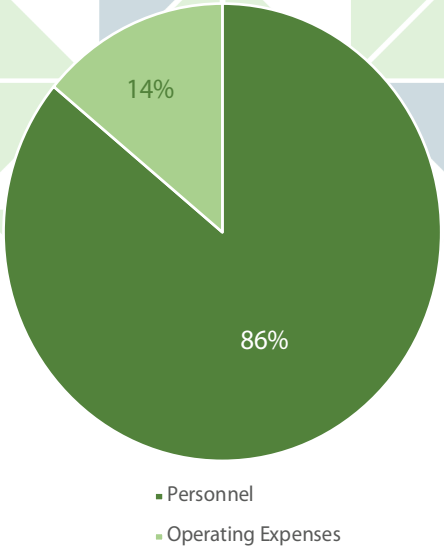
Report and Outlook

With an increase in overall funding, careful management of expenditures, and the leveraging of endowment revenue through strategic partnerships, PCIC continues to enjoy financial stability. PCIC managed 28 active agreements related to user-commissioned projects, research grant programs and other projects in 2015-2016, including the implementation of our renewed 4-year agreement with BC Hydro. Thirteen new funded contracts were signed with local governments, BC ministries and federal agencies, and overall, PCIC maintained more than 45 partnerships. Users and stakeholders provided approximately 45% of PCIC's budget, with in-kind plus direct leverage of funds provided from UVic through an endowment now well beyond the 1-to-1 level. Investment in a personnel complement of 16 PCIC staff, 6 externally-supported researchers and students, 1 PCIC-supported student and 1 intern, ensured the delivery of PCIC's workplan. Further, capital asset expenditures to expand PCIC's computational infrastructure will ensure that PCIC can meet growing data storage and computational requirements. We are committed to continue maximizing our ability to leverage the investments of our collaborators and users in PCIC to produce quality research, products and services.

2015-2016 REVENUE



2015-2016 EXPENSES



Staff and Associates

PCIC Staff and Associates, 2015-2016. Left to right: Charles Curry, Francis Zwiers, Yaqiong Wang, Mohamed Ali Ben Alaya, Valerie Acosta, Mohammad Reza Najafi, Markus Schnorbus, James Hiebert, Kathy Veldhoen, Steve Dainard, Arelia (Werner) Schoeneberg, Trevor Murdock, Stephen Sobie, Michael FIscher, Christian Seiler, Chao Li, Faron Anslow, Norman Shippee, Katherine Pingree-Shippee, Michael Shumlich and Megan Kirchmeier-Young.

COMMUNICATION AND OUTREACH

COMMUNICATION AND OUTREACH

PCIC works to support users in the province who have widely varying needs in terms of scientific analysis, technical guidance and data. Researchers use data from PCIC's Data Portal and research documents from PCIC's three research themes. Planners use PCIC's Analysis Tools and guidance documents. In addition, planners require high-level, plain-language summaries of our understanding of climate events, PCIC's research projects and developments in the research literature. In order to meet the needs of these groups, PCIC publishes project summaries, Science Briefs, newsletters, peer-reviewed publications and collaborates directly with users in the development of summary materials for their regions. PCIC also directly engages with our users and the broader research community through presentations and invites experts whose research is relevant to the needs of our stakeholders to share their knowledge with us in seminars that we host.

COMMUNICATION AND OUTREACH

Presentations and Conferences

Each year, PCIC's researchers are invited to present their research and share their understanding with a variety of groups. These include regional stakeholders, the media and the scientific community. Over the 2015-2016 fiscal year, PCIC staff attended a number of scientific conferences and workshops, several as invited speakers and chairs, were interviewed by the CBC and spoke at community events. In addition, PCIC scientists have made a number of presentations at user and partner requests.

PCIC Director Francis Zwiers delivered a number of invited talks over 2015-2016. Among these, Dr. Zwiers was chosen as the speaker for eastern Canada for the Canadian Meteorological and Oceanographic Society's speaker tour.

The conferences and workshops attended include the American Geophysical Union's annual meeting and Pycon, the largest conferences for earth scientists and Python developers, respectively, as well as the joint congress of the Canadian Geophysical Union and the Canadian Meteorological and Oceanographic Society and the Canadian Water Resources Association BC Branch Conference.

PCIC also collaborated with the Pacific Institute of Climate Solutions on a panel discussion, for UVic's sixth IdeaFest, a public showcase for research conducted on campus. The event, titled, Hotter, Drier Summers? Implications and Adaptations for BC, included presentations from experts in fields ranging from agriculture to water supply, and included a panel discussion moderated by PICS Executive Director, Dr. Sybil Seitzinger.

Link: http://pics.uvic.ca/events/ideafest-hotter-drier-summers-implications-and-adaptations-bc

The audience and presenters for the Hotter Drier Summers? Implications for BC event at the recent UVic Ideafest.

The Pacific Climate Seminar Series

Dr. John Fyfe begins his October talk on the warming hiatus as a part of the Pacific Climate Seminar Series.

Each year, PCIC collaborates with its sister organization, the Pacific Institute for Climate Solutions, to engage with the local community through a series of monthly seminars, allowing researchers to share their knowledge and research results with local stakeholders. This year's series included talks by Dr. Robert Gifford, the founding director of UVic's minor in the Human Dimensions of Climate Change, Dr. John Fyfe, Canadian Centre for Climate Modelling and Analysis senior research scientist, PICS fellow Dr. Iman Moazzen, PCIC fellow Dr. Megan Kirchmeier-Young and PCIC research associate Dr. Charles Curry. The topics covered included climate science communication, the so-called "hiatus" in global warming, extreme event verification, the ability of regional climate models to represent observed extreme climate events and energy pathways in BC.

Science Briefs and Newsletters

In order to meet the need for clear, contextualized translations of recent findings in the scientific literature, PCIC releases plain-language summaries of recent papers. These papers are chosen for their relevance to stakeholders in the BC-Yukon region. This year's Science Briefs covered changes to extreme rainfall events, the impact that data biases may have had in the recent "hiatus" in global surface warming, and the measured and projected changes to glaciers in BC.

PCIC also releases quarterly newsletters that report on PCIC's activities, as well as containing stories that cover some major events in the climate science community. This year these included stories on conferences such as the American Geophysical Union's 48th Fall Meeting, the record-breaking storms that struck the BC coast in August and commentary on the 21st session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change.

COMMUNICATION AND OUTREACH

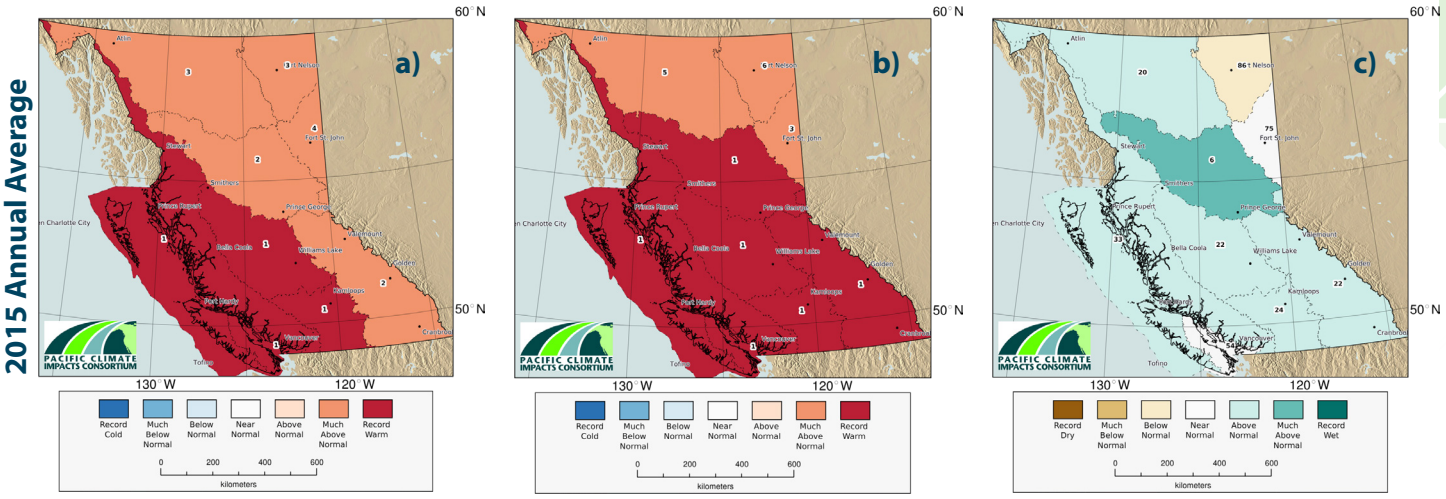
2015: A Year in Review

In order to keep our users abreast of the current state of the Earth's climate, PCIC scientists will occasionally summarize recent developments shortly after they unfold. These are either published in the newsletter or, if they require longer analysis, in stand-alone reports. This was the case when three of the major climate monitoring groups reported that 2015 was the hottest year in the climatological record. In response, PCIC released 2015: A Year in Review, a report which explained and contextualized this finding and then examined climatological conditions in British Columbia for the year (Figure below) and season by season. The report covered several of the major meteorological events that occurred in the province and how these events fit into the historical and global climate contexts.

Publishing Peer-Reviewed Publications

PCIC researchers participate actively in the peer-reviewed literature. This ensures that the models, downscaling methods, analysis techniques and results that PCIC uses meet the highest standards of scientific review and evaluation. Contributing to this environment of sharing and critiquing results and the methods used to arrive at them also helps to increase our overall understanding of these fields, as PCIC researchers provide the knowledge that they have gained and in turn learn from the efforts of scientists who are studying similar phenomena. This helps to move forward those fields that PCIC works in and increases technical resources available to everyone working on these challenges.

Maximum Temperature | **Minimum Temperature** | **Precipitation Anomalies**



Annual ranked anomalies for the ecoprovinces of British Columbia for 2015. Panels a), b) and c) show observed 2015 annual mean maximum temperature, minimum temperature and precipitation anomalies, respectively.

PUBLICATIONS

PUBLICATIONS

PCIC Publications

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PUBLICATIONS

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PACIFIC CLIMATE IMPACTS CONSORTIUM

2015-2016 | CORPORATE REPORT