CANADIAN INSTITUTE FOR CLIMATE STUDIES

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IN THIS ISSUE

The Canadian Institute for Climate Studies is a Division of UVic's Centre for Global Studies

Regional Climate Change

The recent release of new climate change scenarios from the Canadian Regional Climate Model (CRCM) heralds the beginning of a move from coarse resolution Global Climate Model scenarios to the development of CRCM-based specific regional impact results.

In the last issue of the *Climate Network Newsletter* we highlighted some of the fundamental questions remaining with respect to understanding climate change and even climate variability. And, while there remain significant areas of fundamental climate science research to carry out, as well as climate modeling research, progress has been made developing methods for applying climate scenarios, particularly at higher spatial resolution. For example, on page three of this *Bulletin* we discuss the recently released ClimateBC v2.0 software that was developed at the University of British Columbia and that provides regional stakeholders with a scientifically robust way of constructing climate scenarios at required high resolution.

Regional meetings on the effects of climate change within a variety of sectors, such as forestry, water resources and health frequently occur in all regions of Canada. By their nature, they often focus on the fine scale. The *Canadian Climate Impacts and Adaptation Research Network*, recognizing this, is bringing one such group together - the building industry - for a national meeting on climate impacts in Montreal May 4-7.

The *Climate Change Impacts and Adaptation Program (CCIAP)* also recognizes the finer scale, amongst others, and in their most recent "call for proposals" sought projects at the community level. This 'call' was so popular that it received requests for more than five times as much funding as was available, highlighting the fact that Canadian regions and communities are eager to pursue research into climate impacts. They have a need for specific and relevant climate change information. In addition, CCIAP is also coordinating a nation-wide climate change assessment, as an update to the 2001 *Canada Country Study*. The new study is to be released in 2006.

Canada will also play host to *Cop-11* - the *Conference of Parties to the Kyoto Protocal* this Fall, during which an "Adaptation Day" will feature regional impacts and scientific advances in adaptative capacity.

With the ratification of the Kyoto protocol behind us, it seems that the political aspect of the climate change debate has lost some of its sense of urgency. The important job of identifying adaptation strategies to climate variability and climate change – which is vital regardless of political stance on mitigation of emissions – seems to be getting more attention. Of course, development of adequate adaptation strategies requires impacts assessments based on climate scenarios and development of robust techniques to make use of scenarios on appropriate scales.

With this momentum the development of regional centres to study climate change impacts seems inevitable. The Ouranos Consortium had enough foresight two years ago, to recognize this need and brought climate change information to local stakeholders in Quebec. The *Canadian Institute for Climate Studies* plans to build on this trend. Recently CICS received a support grant from the BC provincial government and seeks other partners and stakeholders interested in regional impacts in Western Canada, in the Pacific Northwest and in British Columbia, where we are located.

From the Executive Director

Spring is a time for renewal, and the Canadian Institute for Climate Studies (CICS) is no exception. CICS has always been adept at evolving as an Institute along with the changing state of climate science and changing needs of our clients and affiliates. The result is an organization that has brought its breadth of expertise to bear on gradually changing targets.

CICS was founded in 1993 to manage the Climate Research Network, with a focus on fundamental academic but applied research in order to improve Canadian capacity in climate modeling.

Shortly after the Climate Research Network was operational, CICS began developing seasonal climate predictions, which we continue to publish today in our *Seasonal Climate Bulletin* as well as providing online access to detailed region by region predictions.

The next major project of the Institute came with the Canadian Climate Impacts and Scenarios project from 1999 through 2004.

Throughout each of these phases, CICS has been available on a contract basis to assist with various Climate Applications projects. Even within these smaller projects, a shift has been apparent. Focus has gone from analyzing climate data and past trends to scenarios and most recently a new area of interest has been emerging. This time the shift in focus of scientific activities requires a geographical shift as well.

The 'Scenarios' project operated by CICS under the direction of the Adaptation Impacts Research Group of Environment Canada has been widely regarded as highly successful and important in advancing the science of climate change impacts. For the last six years, the Scenarios project has provided training (in collaboration with the assistance of the Canadian – Climate Impacts and Adaptation Research Network), access to Global Climate Model data, maps, and tools to the climate science community across the country.

With newly available Regional Climate Model data, it is time to move from delivery of scenarios to development of techniques and provision of services for the undertaking of regional and local impacts studies. The consortium that has produced the Canadian Regional Climate Model results – Ouranos - has also been aware of this next step since their launch in 2002. This step requires multi-disciplinary work. It requires academic, government, and corporate cooperation. It requires a champion in each region.

CICS is actively engaging stakeholders in the Pacific region in order to facilitate the use of regional impacts of climate change, as well as climate variability.

Gordon Smith
Acting Executive Director

Editor's Note

In light of CICS interest in developing tools for use by regional stakeholders, we present a tool that has recently been made available in Western Canada for dowscaling climate scenarios to high resolution on pages 3 and 4.

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Climate BC Software

This overview of "Climate BC" - a program to generate scale-free climate data for western Canada - was prepared by Sally Aitken, Andreas Hamann and Tongli Wang of the Centre for Forest Gene Conservation (CFGC) at the University of British Columbia. The model was developed in partnership with Dave Spittlehouse of BC Ministry of Forests, Research Branch and Sally Aitken (CFGC) at UBC with assistance and data from the Canadian Institute for Climate Studies Scenarios Project website.
www.cics.uvic.ca/scenarios

Applying climate data in resource management and climate change research requires matching the spatial scale of the resource databases, baseline climate data, and climate change predictions. This is often a difficult task for resource managers and even researchers. Geographical information systems help yet even so there are limitations:

(1) the low resolution of 2 or 4 km of available baseline data, introducing considerable error in mountainous areas,
(2) the lack of biologically relevant variables, and
(3) the difficulty of integrating coarse resolution predictions of future climates from global circulation models.

The authors have developed methodology to generate scale-free climate data through the combination of interpolation techniques (Wang et al. 2005) and elevation adjustments (Hamann and Wang 2005). With these techniques, climate conditions can be predicted for any point defined by latitude, longitude and elevation in British Columbia, the Yukon Territories, the Alaska Panhandle, and parts of Alberta and United States. In addition, the user

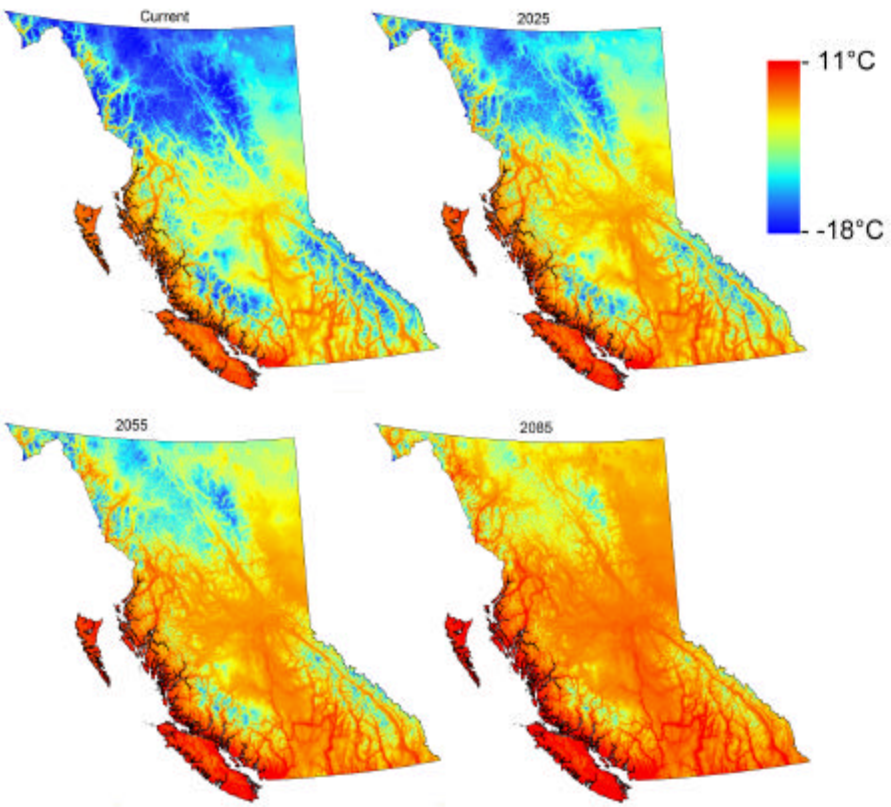

Figure 1. High resolution maps of mean annual temperature for current and the years 2025, 2055 and 2085 according to predictions of CGCM2 A2x for British Columbia generated by ClimateBC.

can select from a number of available climate change scenarios to be automatically integrated in estimating climate for a point or a region (Figure 1 above).

Further, equations were developed and integrated into the ClimateBC software to calculate biologically relevant climate variables including various degree-days, number of frost-free days, frost-free period and snowfall from monthly temperature and precipitation data (Wang et al. 2005). Estimates of these climate variables were validated using actual observations at weather stations to evaluate the quality of these predictions.

To make this data easily accessible, a stand-alone MS Windows application was developed to perform all calculations and to integrate future climate predictions from various global circulation models (see Figure 2 on page 4). The user can select input latitude and longitude of a location of interest, and the program outputs 15 derived, biologically relevant climate variables in addition to mean monthly, seasonal, and annual maximum temperature, minimum temperature and precipitation.

The model is available for download http://genetics.forestry.ubc.ca/cfgc/climate-models.html

(continued on page 4)

Climate BC

(continued from Page 3)

References

Hamann, A. and Wang, T. 2005. Models of climatic normals for genecology and climate change studies in British Columbia. Agric. For. Meteorol. 128: 211-225.

Wang, T., Hamann, A., Spittlehouse, D.L., and Aitken, S.N. Development of scale-free climate data for western Canada for use in resource management. Internat. J. Climatology (submitted)

For climate news and events we recommend signing up for email lists at the following two Canadian websites:

Biocap www.biocap.ca

C-CIARN www.c-ciarn.ca

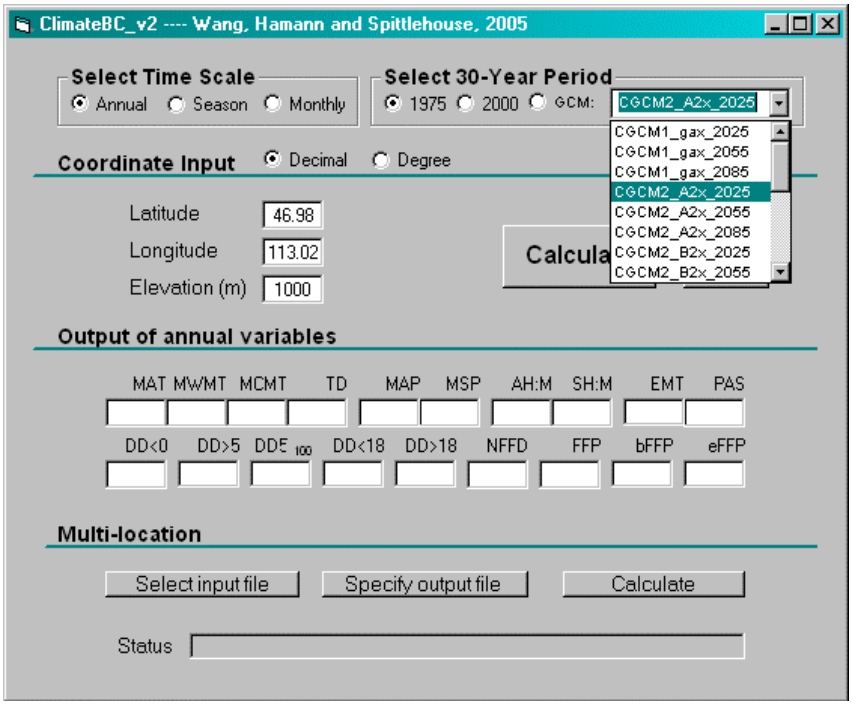

Figure 2. Interface of the ClimateBC program

PRISM Baseline Climatology

From the resource management perspective, particularly in British Columbia, with complex mountainous terrain, a resolution of 4 km is considered low. The Climate BC Software fills the need for development of climate scenarios at any specified location. The methodology allows for going beyond even this resolution.

The use of the PRISM climatology means that at the resolution of 4 km, useful information about the elevation and terrain in each grid box is being made use of. More information on the PRISM climatology itself is available at http://www.ocs.orst.edu/prism/

By applying climate scenarios, themselves available at resolutions of hundreds of kilometers, to the PRISM baseline a large improvement over simply interpolating low resolution baseline and model results onto a finer scale has been achieved.

With the ClimateBC technique and software now available, impacts researchers in Western Canada and the US will be able to construct climate change projections for Temperature, Precipitation, and several other derived parameters in a robust way, at a scale appropriate for use by stakeholders with differing resolution needs.

Plans are underway to incorporate the PRISM climatology and the ClimateBC methodology into the Canadian Institute for Climate Studies Scenarios Project website at www.cics.uvic.ca/scenarios
This is in keeping with CICS goals to develop and provide scenarios tools of particular use on a regional and community basis.