CENTRE FOR ENHANCED FOREST MANAGEMENT

ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

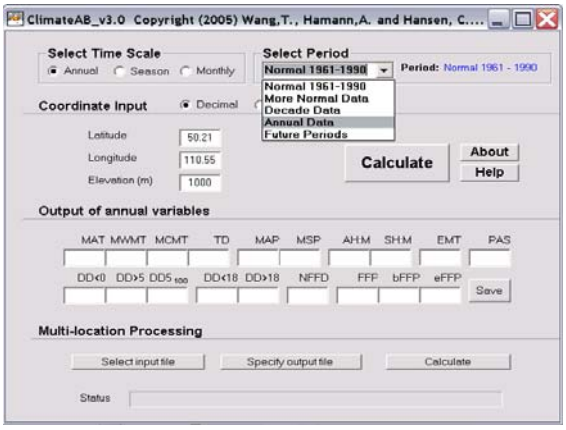
EFM RESEARCH NOTE 01/2010

A comprehensive database of historical and projected climate for western North America

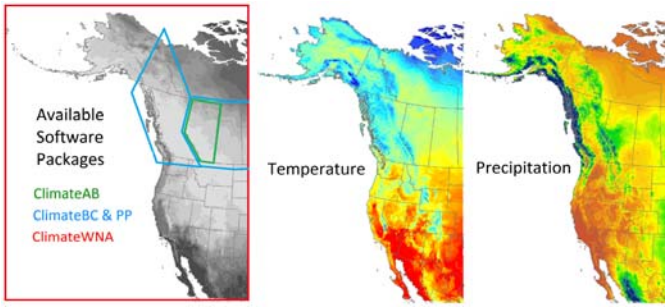
MBOGGA, M. S., WANG T., AND A. HAMANN

With growing concern over climate change, interpolated climate data have become increasingly important for biological research and applications in forest management, conservation policy development, and infrastructure planning. Virtually every study in the field of climate change impact and adaptation research requires a variety of data that may include climate normal data, climate change projections, long-term historical records, or information about recent climate trends. Such data are usually not easily accessible at the appropriate resolution, in a consistent format, and for a comprehensive set of relevant climate variables.

Methods: We generated a comprehensive set of interpolated climate data for western North America, including monthly data for the last century (1901 to 2006), future projections from general circulation models (68 scenario implementations from 5 GCMs), as well as decadal averages and multiple 30-year climate normals for the last century. For each of these time periods, we calculated a large set of basic and derived, biologically relevant climate variables, such as growing and chilling degree days, descriptors of growing season length, frost free days, extreme minimum temperatures, etc. To balance file size versus accuracy for these approximately 15,000 climate surfaces, we provided a stand-alone software solution (screenshot below) that adds or subtracts historical data and future projections as medium resolution anomalies (deviations) from the high resolution 1961-1990 baseline normal dataset.



Applications: The database is useful for a variety of purposes, but perhaps the most pertinent application is the analysis of historical biological records to establish correlative relationships with climate variability. If a correlative relationship is supported by a plausible causal link between climate and a biological response, this may be the most effective approach to predict impacts of projected climate change, and to better understand plant-climate relationships. Examples are: historical surveys of forest pests and diseases, records of wildlife population dynamics and migratory behaviour, or tree ring data.



Limitations: This database and software provide easy access to climate data at any scale but we note important limitations. Small-scale temperature gradients along mountain slopes are well characterized (up to a resolution of 250m), but microclimatic conditions of any other kind (frost pockets, vegetation influence, slope angle and aspect) will not be correctly represented. All climate grids are generated from standard weather stations in flat open areas and consequently represent those conditions.

Funding was provided by Alberta-Pacific Forest Industries, Ainsworth Engineered Canada LP, Daishowa-Marubeni International Ltd., Western Boreal Aspen Corporation, Weyerhaeuser Company Ltd., and NSERC.

Further Information:

Mbogga, M., Hamann, A. and T. Wang 2009. Historical and projected climate data for natural resource management in western Canada. Agr. For. Met. 149: 881–890

Data access: UBC: http://tinyurl.com/yb3fd32
Uof A: http://tinyurl.com/yd495mq

Centre for Enhanced Forest Management, Dept. of Renewable Resources, U of A, Edmonton, AB T6G 2H1

Contact: andreas.hamann@ualberta.ca