

Climate Change Models, Verification and Ensembles – An Ontario Focus

Neil Comer, Ph.D.

Adaptation and Impacts Research Division (AIRD), Environment Canada

AIRD is strongly involved in the provision of relevant and practical information on climate change for Ontario and all of Canada's regions. Given the number of models (both Global-GCM and Regional-RCM), and emission scenarios available for consideration, there is no shortage of possible future projections of our climate. The wealth of information available can be overwhelming, and sound information, advice, application, interpretation, analysis of the results, and their uncertainties is required. The Canadian Climate Change Scenarios Network (CCCSN.CA) has become a major source for climate change information, with traffic approaching 2 million visits for this year and increasing. Within the multi-partner CCCSN, training sessions for end-users on model background information and their validation, and projections, have been held across Canada with more planned.

Validation results of climate change models against historical climate data (both observed station data and gridded continuous datasets), have shown there can be large biases with some models (too cold historically, too warm, too wet, too dry). Clearly some models do better than others. Validation is complicated in northern Ontario, however, by the limited availability of long-term meteorological observations for large areas of the province. In these areas, gridded datasets interpolated from nearby stations are our only option.

Recent journal articles have shown that the use of a single or small subset of models for climate change projections is unwise, with preference for an 'ensemble approach' which is expected to produce the best likely estimate. This is not surprising, since one might erroneously select a single model with significant historical bias, and/or a model with extreme projections for the future (far too high or too low). The ensemble mean projection produces an all-model value which weights all models equally. Each GCM is regridded to a common grid resolution and then analysed. The ensemble technique has the advantage of allowing for at least a basic measure of spatial model uncertainty (i.e. where is there high versus low model agreement). As part of CCCSN, 'Ensemble Scenarios for Canada, 2009' will soon be released, providing end-users with ensemble information for practical application. The information is provided at a national and regional scale for the 2050s (2041-2070) future time period. Not unlike other regions, the greatest temperature increase is projected for the winter season and for more northerly portions of the province (up to 6°C). Similarly, precipitation from the ensemble projection is also expected to generally increase (except for summer), with the greatest increase to the north (up to 30%). The patterns found within Ontario are similar for both the GCM and RCM ensembles, with greatest differences in areas proximal to the Great Lakes and Hudson Bay due to the increased spatial scale available from the RCM. Results of this work in Ontario will be highlighted.