

CONTEXT

In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period in the last 1400 years. Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Global surface temperature change by the end of the 21st century is likely to exceed 2°C under the representative concentration pathway RCP6.0 and RCP8.5. Warming will continue to exhibit interannual-to-decadal variability and will not be regionally uniform. As the most populated and the second largest province of Canada, Ontario is vulnerable to climate change. Thus, it becomes increasingly important for the provincial and municipal governments as well as the public to be aware of both current and future potential changes in Ontario’s climate as it is likely to continue to change in the decades to come.

APPROACH

The Impacts of Climate Change Group at Laboratory of Mathematical Parallel Systems (LAMPS) of York University analyzes and interprets climate information from observed, reanalysis data and climate model simulations to generate climate scenarios in Ontario. The group also investigates the potential impact of climate change on agriculture, public health, infrastructure and other aspects. The following maps present an example of projected temperatures over Ontario for 2050s [2041-2070] based on simulations statistically downscaled from all available 29 AR5 GCMs under the emission scenario RCP8.5. Biases were further corrected with the third generation NCEP high resolution reanalysis product (CFRSR). The resolution of the projected data is about 32km. The observed values were interpolated from the CRU TS3.21 Mean Temperature ((0.5 x 0.5 degree). The temperature scenario shown here is the 29-member ensemble for 2050s. The change is the difference between the ensemble mean and the observed data. The ensemble spread is the standard deviation of the ensemble mean of the modelled climate.

Figure 1:
SUMMER (JJA)
TEMPERATURE
SCENARIO IN
ONTARIO

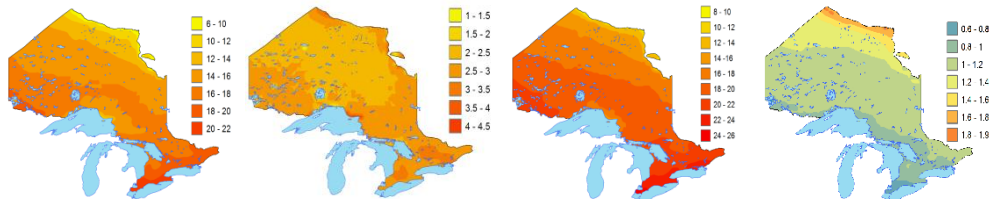
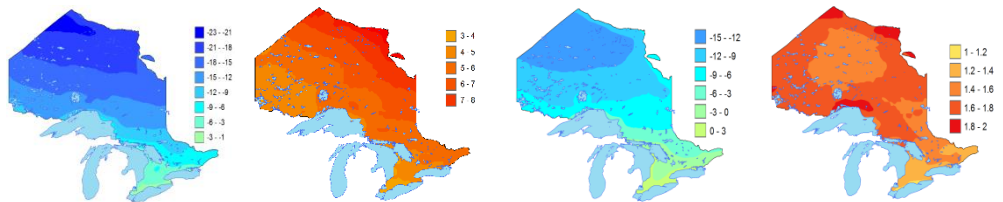


Figure 2:
WINTER (DJF)
TEMPERATURE
SCENARIO IN
ONTARIO



a) Observed data from 1981-2010 b) projected changes c) projected mean temperature d) Ensemble spread

RESULTS

The projected scenarios indicate a general increase in the average temperature with the largest increases in winter over northern Ontario. Observed summer mean temperatures [21°C to 7°C] respectively in the Southern and Northern Ontario [Fig. 1a] are expected to increase by 1.5 to 4°C [Fig. 1b], while winter mean temperatures are projected to rise by 4 to 8°C [Fig. 2b] to reach 2 to -14°C [Fig. 2c] by 2050s.

Maps of ensemble standard deviation show that uncertainties about projected changes in temperature are larger in winter than in summer in Ontario [Figs. 1d and 2d]. Even with a maximum ensemble spread of 2°C, the rising temperature signal is especially robust in winter.

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Lamps Climate Change Group
York University

Contact: Huaiping Zhu
Huaiping@yorku.ca
 416-736-2100. Ext: 20188
<http://occp.lamps.yorku.ca/>

LEAD SCIENTISTS

- Dr. Ziwang Deng
- Dr. Xin Qiu
- Prof. Huaiping Zhu