

CONTEXT

Increasing greenhouse gas (GHG) emissions have been shown to be a significant contributor to global warming over the past ~100 years with land regions warming faster than the oceans, and heightened effects of annual global warming in the polar regions. The evidence also shows that the rate of this warming is accelerating with widespread and potentially significant impacts on environment, society, and economy. The rate and magnitude of observed and projected warming varies regionally and seasonally across Quebec, and knowledge of where and how fast temperature is changing is essential for evaluating potential impacts.

APPROACH

The Ouranos Climate Scenarios Group analyzes and interprets temperature and other climate information from the recent past and from climate model simulations over different future time horizons (e.g. 2020, 2050, 2080) to generate climate scenarios. The following maps present an example of scenarios of projected temperatures over Quebec for 2050 (2041-2070) based on 17 simulations from the Canadian Regional Climate Model (CRMC)^a. This model includes the more commonly used greenhouse gas and aerosols SRES A2 emission scenario* as well as does the Canadian Coupled Global Climate Model (CGCM)^{b, c}. The mean temperature change from the CRMC runs is added to the observed seasonal mean temperatures for 1961-1990 (the delta method) to generate future maps of summer (JJA - June, July, August) and winter (DJF - December, January, February) temperatures. The observed values were extracted from a 10-km gridded dataset^d. The standard deviation of the 17 runs is issued from different combinations between MRCC runs and its driving CGCM model, as well as from various initial conditions of the CGCM models itself; other factors contributing to the total uncertainty are not included in the estimate of the standard deviations presented here.

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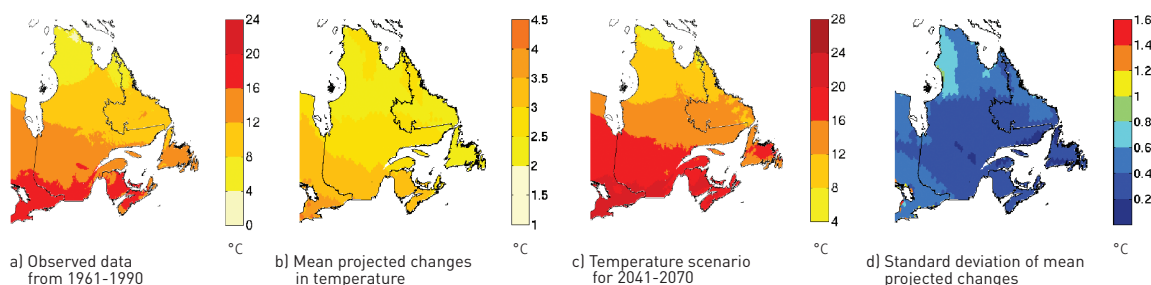
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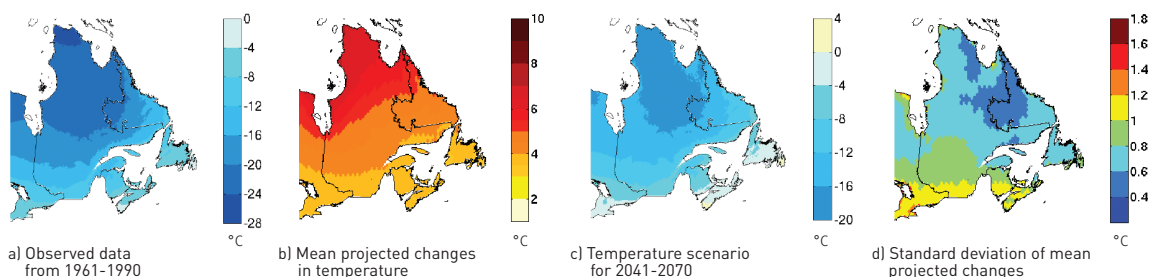
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Research done in 2010

**Figure 1:
SUMMER (JJA)
TEMPERATURE
SCENARIO
IN QUEBEC**



**Figure 2:
WINTER (DJF)
TEMPERATURE
SCENARIO
IN QUEBEC**



RESULTS

The projected changes indicate a general increase in the mean temperatures with the largest increases in winter over northern areas. Observed summer mean temperatures (20°C to 3°C respectively from South to North, Fig. 1a) are expected to increase by 2 to 3°C (Fig. 1b). Winter mean temperatures will rise by 3 to 7°C (Fig. 2b) to reach -4°C and -19°C (Fig. 2c) respectively.

Maps of standard deviation show that uncertainties about projected changes in temperature are larger during winter than for summer in Quebec for the 2050 time horizon (Fig. 1d and 2d). Even with such a high uncertainty, the increasing temperature signal is especially robust in winter. The choice of a larger simulations ensemble would be associated with an even more pronounced standard deviation, especially in summer.

REFERENCES CITED

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* <http://www.ipcc.ch/pdf/special-reports/spm/sres-fr.pdf>