

CONTEXT

Global warming induced by increasing emissions of greenhouse gases (GHG) will change the amount of precipitation over northern land areas such as Quebec ^a. As such it is necessary to assess the rate and amplitude of the anticipated changes in precipitation - including extremes - in order to evaluate potential impacts due to a changing climate and to recommend adaptation measures for issues of river flood management, urban drainage, irrigation, hydro-electricity generation, etc.

APPROACH

The Ouranos Climate Scenarios Group aims at analyzing past and future precipitation events. The following maps present an example of future precipitation scenarios over Quebec for the time horizon of 2050. The future amount of total precipitation (rain and snow) is based on 17 simulations from the Canadian Regional Climate Model (CRCM) ^b driven at its boundaries by the Canadian Coupled Global Climate Model (CGCM) ^{c, d}; both models are forced by the most commonly used (for North America) projected evolution of greenhouse gas and aerosols SRES A2*. The mean simulated precipitation change is added to the observed seasonal mean total precipitation for 1961-1990 (the delta method) to generate future maps of summer (JJA - June, July, August) and winter (DJF - December, January, February) precipitation. The observed values were extracted from a 10-km gridded dataset ^e. The runs are issued from different versions of the models, as well as from various initial conditions. Uncertainties (differences between the projections) are represented by the standard deviation about the average. Other factors may also contribute to the total uncertainty but are not included here.

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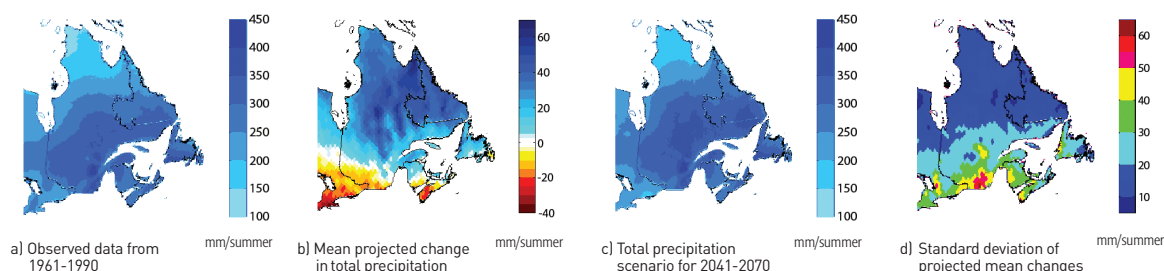
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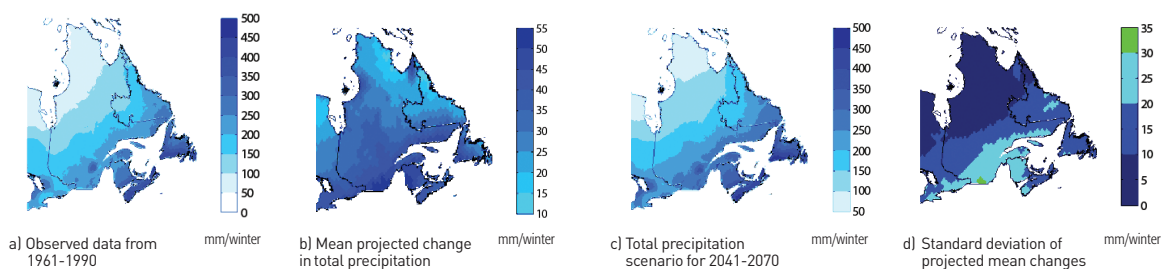
² Ouranos

Research done in 2010

**Figure 1:
SUMMER (JJA)
TOTAL
PRECIPITATION
SCENARIO
IN QUEBEC**



**Figure 2:
WINTER (DJF)
TOTAL
PRECIPITATION
SCENARIO
IN QUEBEC
(expressed as snow
water equivalent)**



RESULTS

In southern Quebec an increase in winter precipitation of 30 to 55 mm is expected, while there is no significant change during the summer. Annually, projected increases in the northern Quebec range from 10 to 40 mm. Winter snowpack is projected to increase over northern Quebec, but decrease over southern Quebec. This is due to a greater amount of precipitation falling as rain in the southern regions.

The signal of precipitation change is robust for northern Quebec as expected changes are larger than the level of uncertainty (standard deviation). However, the signal in the southern Quebec is not as obvious as changes are masked by a larger level of uncertainty.

REFERENCES CITED

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