PROJECTED PRECIPITATION CHANGES IN ONTARIO FOR 2050s

CONTEXT

Averaged over the mid-latitude land areas of the Northern Hemisphere, precipitation has increased since 1901. There are likely more land regions where the number of heavy precipitation events has increased than where it has decreased. The frequency or intensity of heavy precipitation events has likely increased in North America. Extreme precipitation events over most of the mid-latitude land masses will very likely become more intense and more frequent toward the end of this century, as global mean surface temperature increases (IPCC). As the most populated and the second largest province of Canada, Ontario is vulnerable to climate change; therefore, it becomes increasingly important for the provincial and municipal governments as well as the public to be aware of both current and future changes in Ontario's climate.

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

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 precipitation 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 (CFSR). The resolution of the projected data is about 32km. The observed values were interpolated from the CRU TS3.21 Mean precipitation (0.5 x 0.5 degree). The precipitation scenario is the mean of the 29-member ensemble for 2041-2070. The change is the difference between the ensemble mean and the observed data. The ensemble spread is the standard deviation of the ensemble of the means for 2041-2070 from the models.

Figure 1: SUMMER (JJA) PRECIPITATION SCENARIO IN ONTARIO

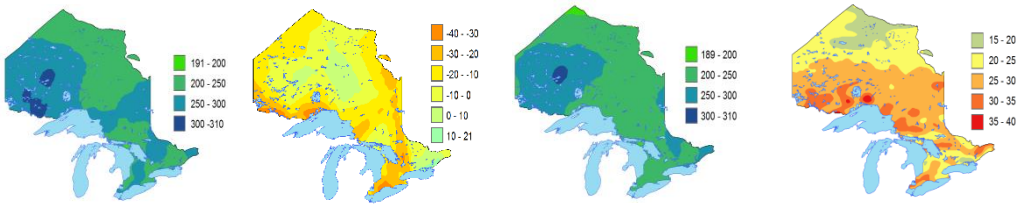
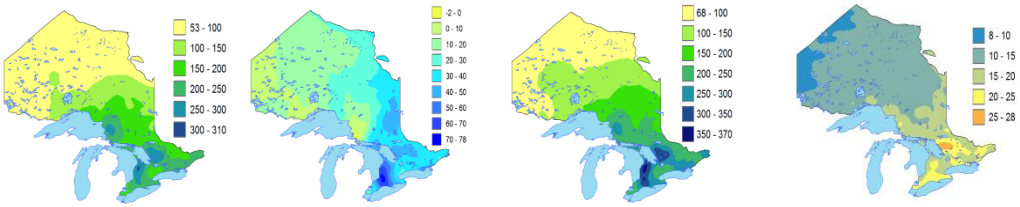


Figure 2: WINTER (DJF) PRECIPITATION SCENARIO IN ONTARIO



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

RESULTS

The projected scenarios indicate a general increase in winter precipitation with largest increases over southern Ontario [Fig. 2b] and a general decrease in summer precipitation over most of Ontario with significant spatial variation [Fig.1b]. Observed winter precipitations [53-310mm, Fig.2a] are expected to increase to [68-370mm, Fig. 2c].

Maps of ensemble standard deviation show that uncertainties in projected changes of precipitation are larger than the projected changes in summer over some areas [Figs. 1b and 1d]; while the uncertainties in projected changes of precipitation are smaller than the projected changes during winter over most of Ontario [Figs. 2b and 2d].

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