

SOREMA

**REFLECTIONS ON THE FUTURE -
CLIMATE CHANGE AND ITS IMPACTS
ON THE INSURANCE INDUSTRY**

*A Presentation to the
Institute for Catastrophic Loss Reduction
June 9, 2000
by Angus H. Ross, Chief Agent
SOREMA N.A.*

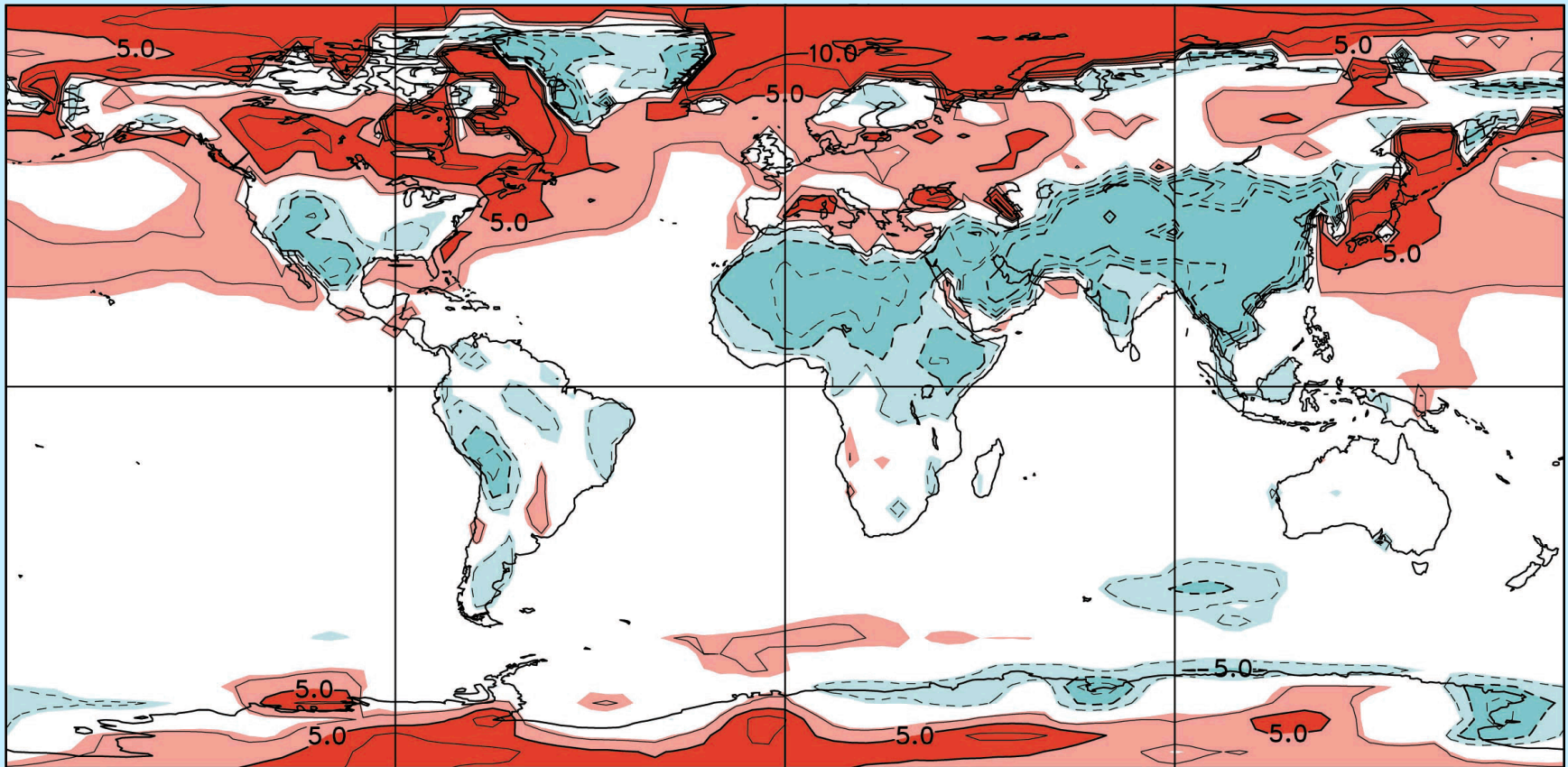
Sorema North America Reinsurance Company
(Canadian Branch)



CLIMATE CHANGE GLOBAL IMPACTS

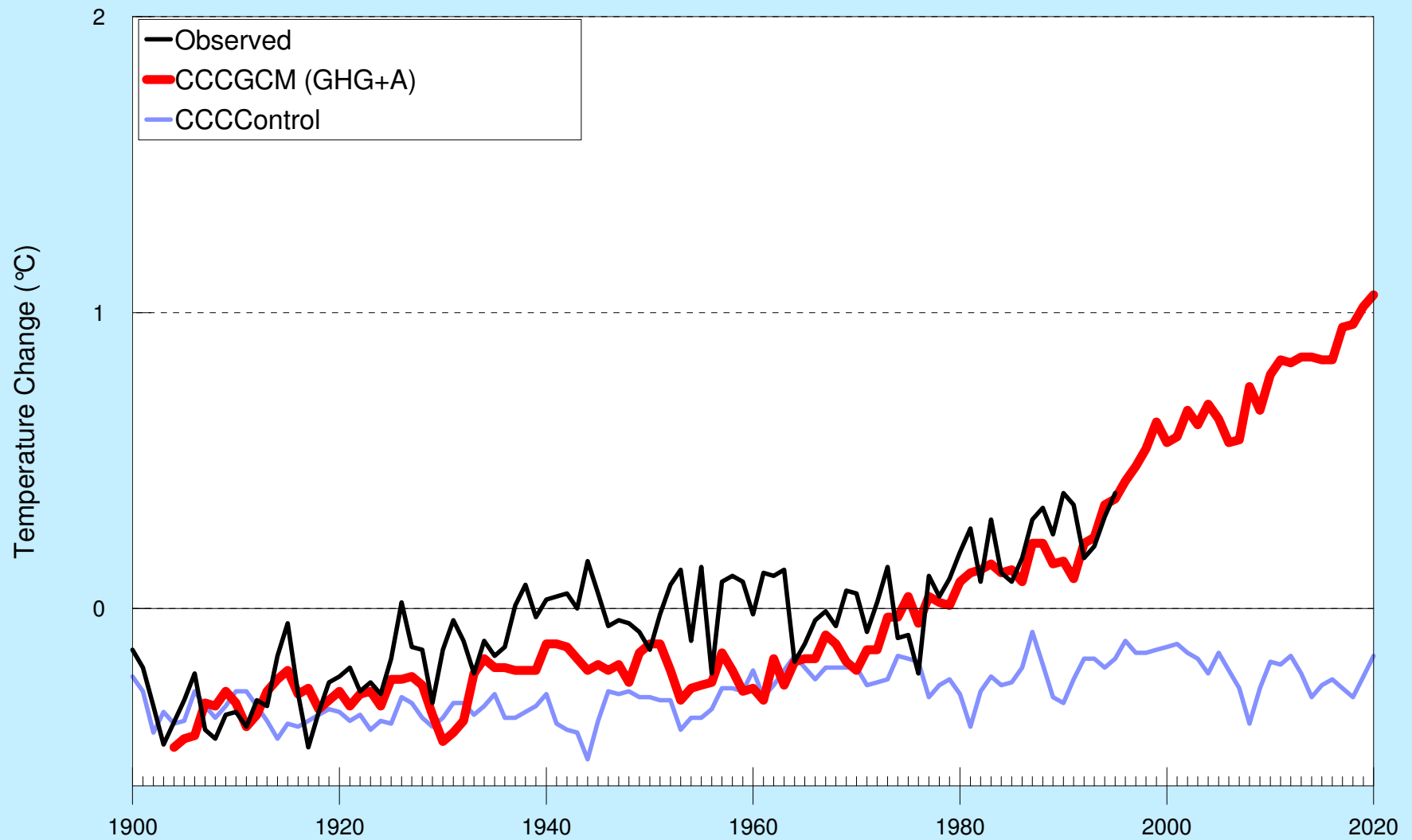
- Sea level rise
- Catastrophe frequency and severity
- Health
- Drought
- Famine
- Environmental refugees

Discrepancies in Modelled vs Observed Surface Temperature



Source: Flato *et al.* (2000)

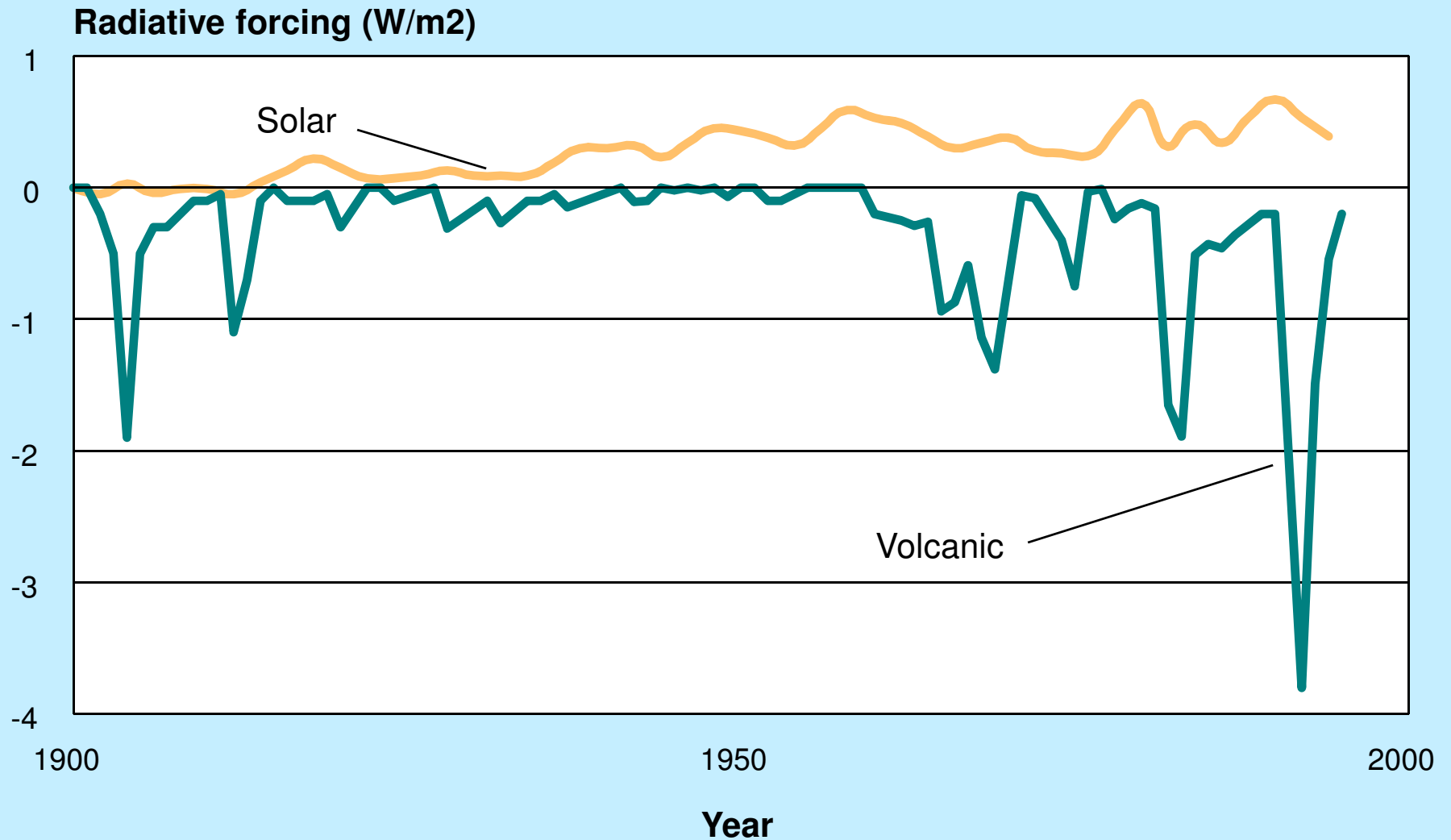
Projected and Observed 20th Century Temperature Trends



Sources: Flato et al. (2000); NOAA

Recent Causes for Climate Change

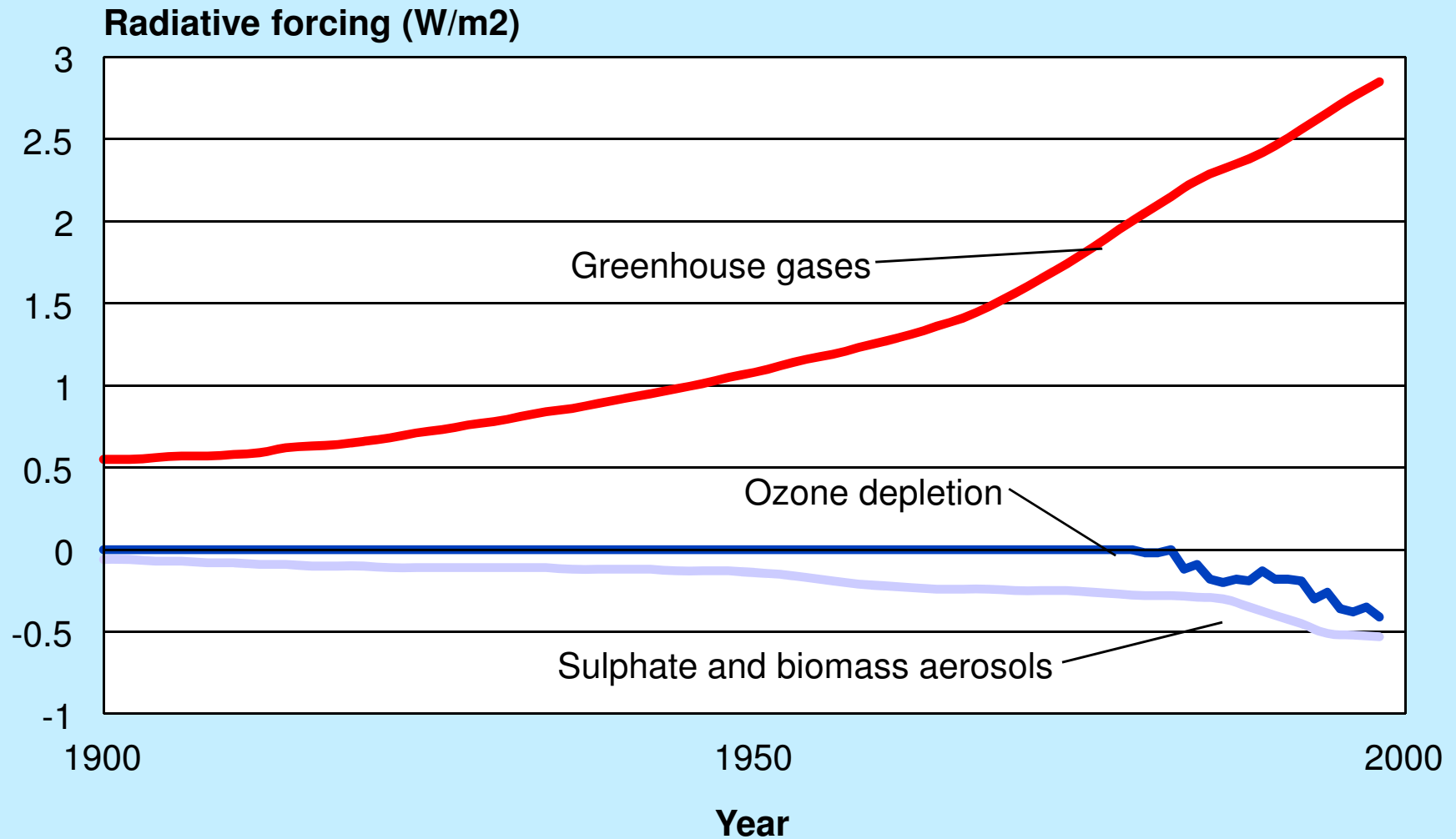
Trends in Radiative Forcing From Natural Causes



Sources: Lean *et al.* (1995); Schimel *et al.* (1995)

Recent Causes for Climate Change

Trends in Radiative Forcings Due to Anthropogenic Causes

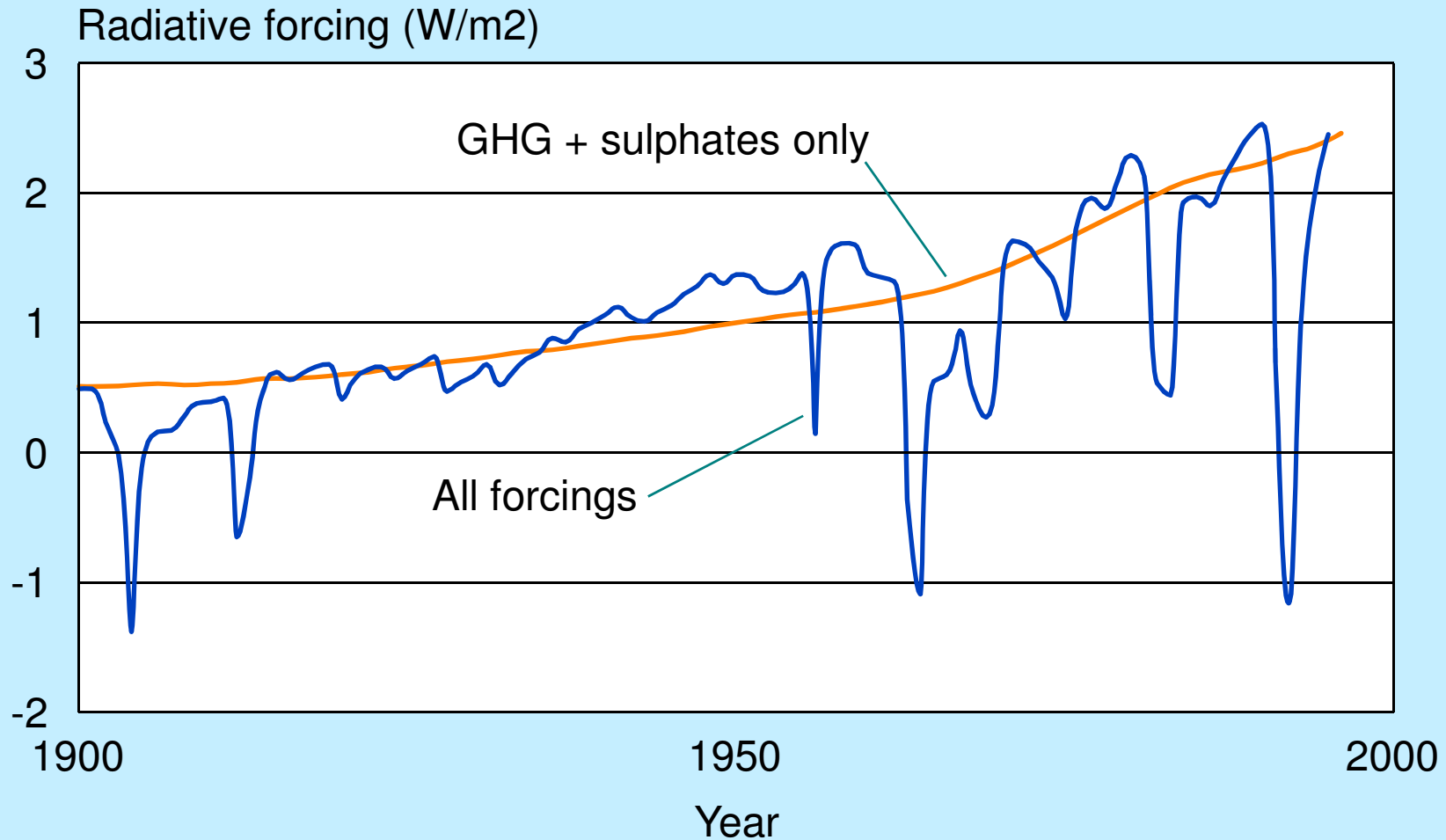


Sources: Shine *et al.* (1990); Schimel *et al.* (1995); Hansen *et al.* (1997)

Recent Causes for Climate Change

Comparison of Trends in Radiative Forcing: Causes vs GHG+Aerosols

All

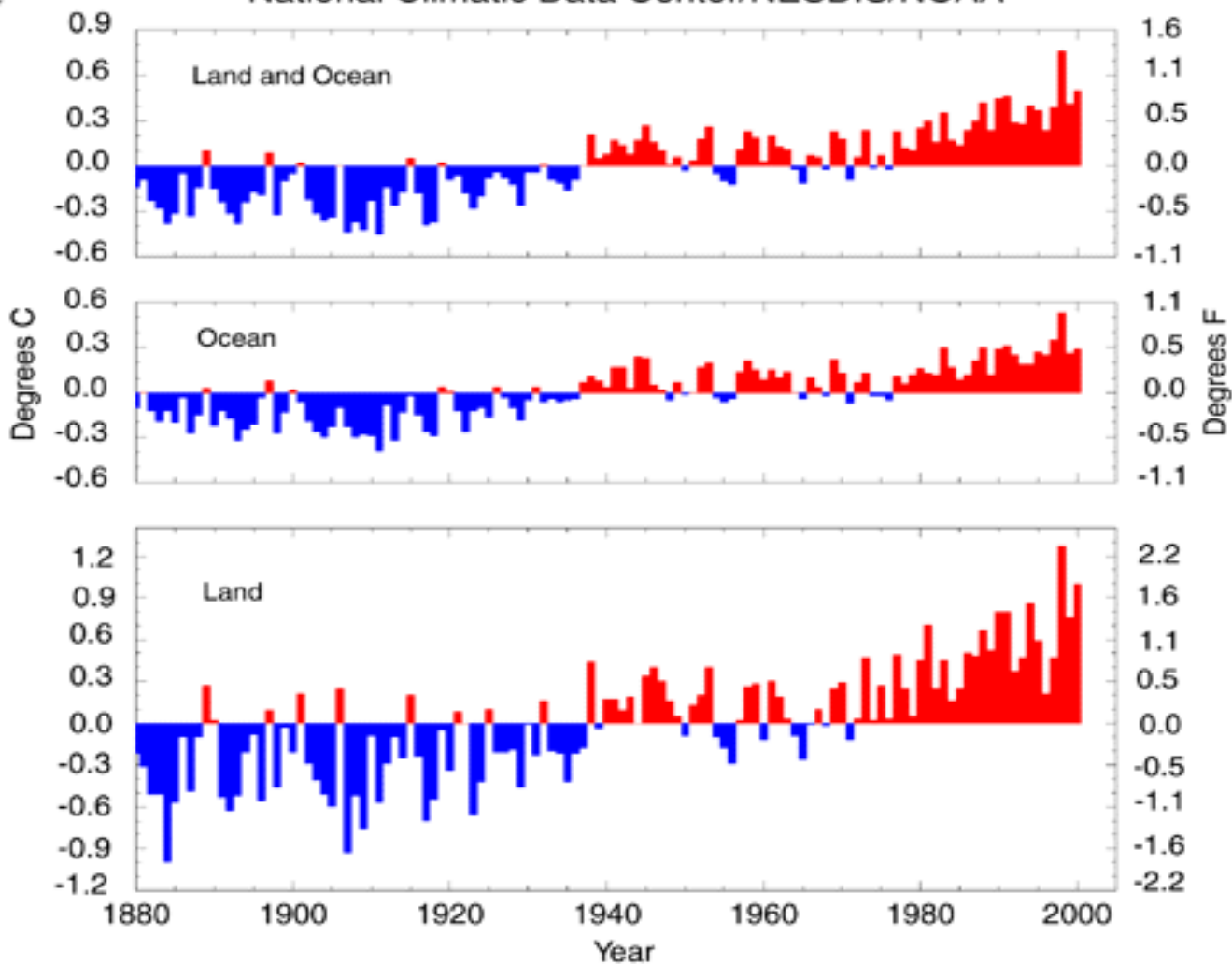


Sources: Shine *et al.* (1990); Schimel *et al.* (1995); Hansen *et al.* (1997); Lean *et al.* (1995) and Hofmann *et al.* (1998)



April Global Surface Mean Temperature Anomalies

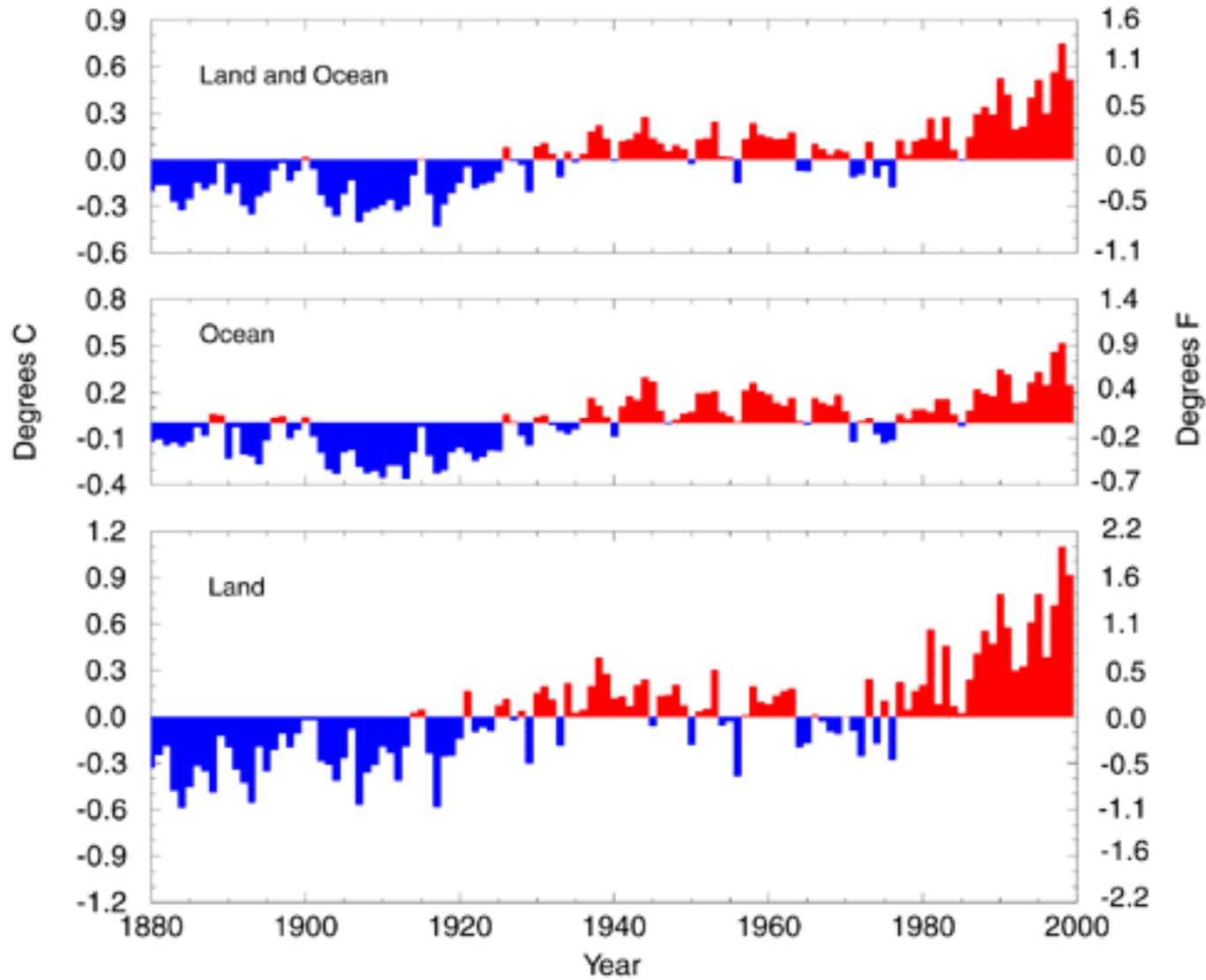
National Climatic Data Center/NESDIS/NOAA



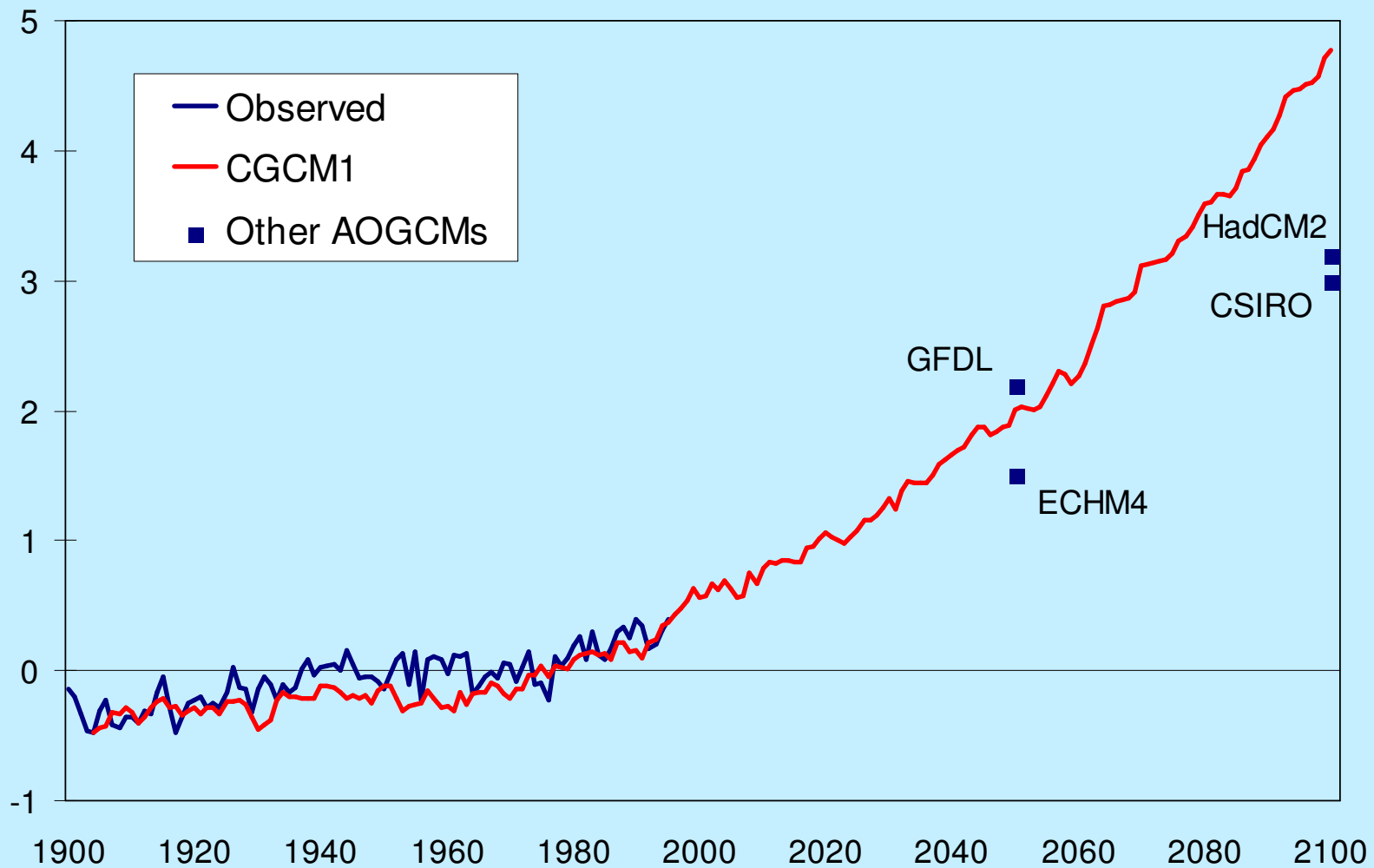


Annual Surface Mean Temperature Anomalies (N. Hem)

National Climatic Data Center/NESDIS/NOAA

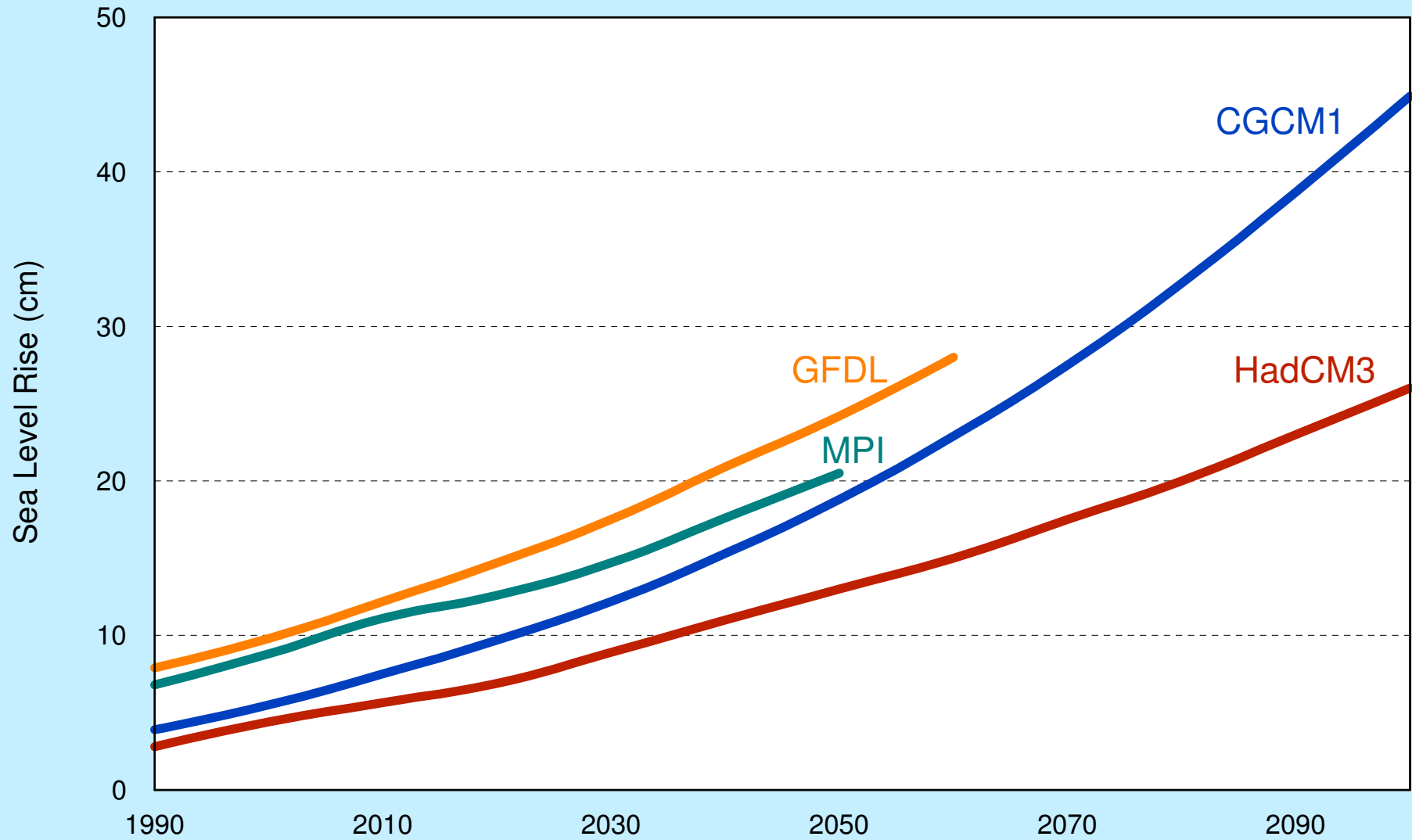


Projected Changes in Global Surface Temperature



Sources: Boer *et al.* (2000); IPCC Data Distribution Centre

Projected Global Sea Level Rise



Sources: CCCma; IPCC Data Distribution Centre

CLIMATE CHANGE GLOBAL IMPACTS

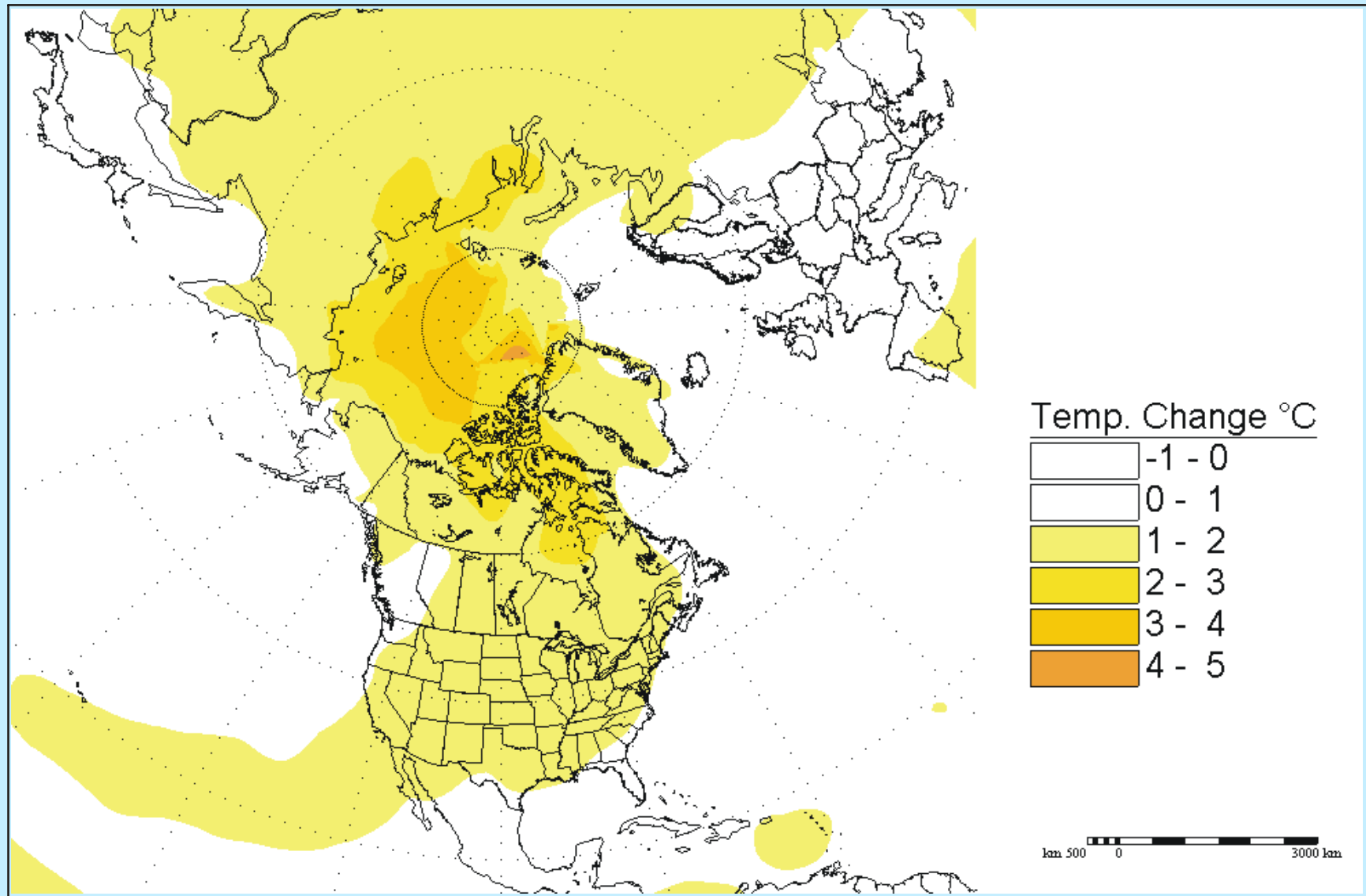
- Sea level rise
- Catastrophe frequency and severity
- Health
- Drought
- Famine
- Environmental refugees

FINAL YEAR OF THE MILLENNIUM

- Largest number of natural catastrophes
- Second highest insured loss numbers
- Highest non-quake economic losses

Projected Temperature Change Between 1975-1995 and 2010-2030

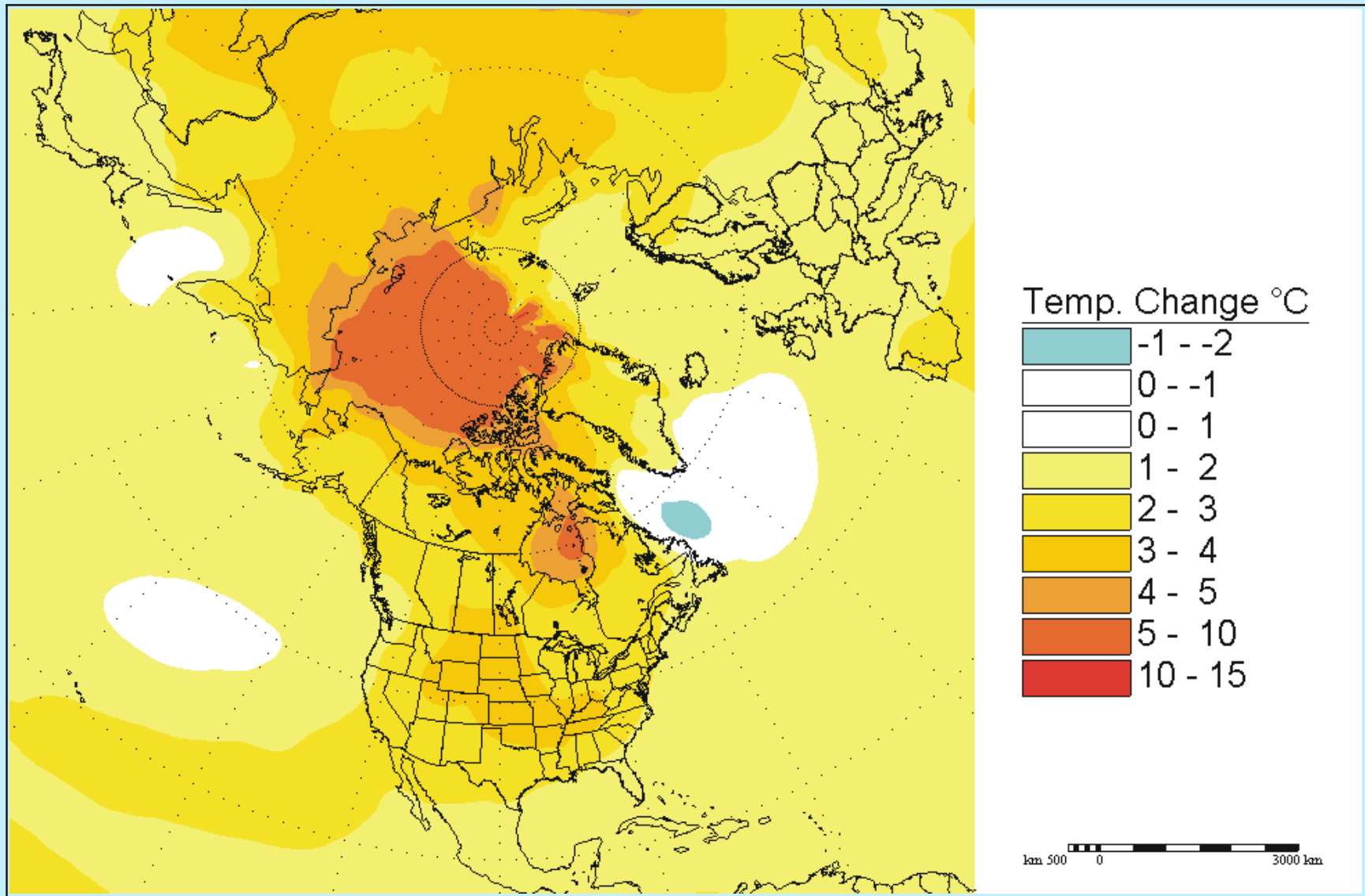
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Temperature Change Between 1975-1995 and 2040-2060

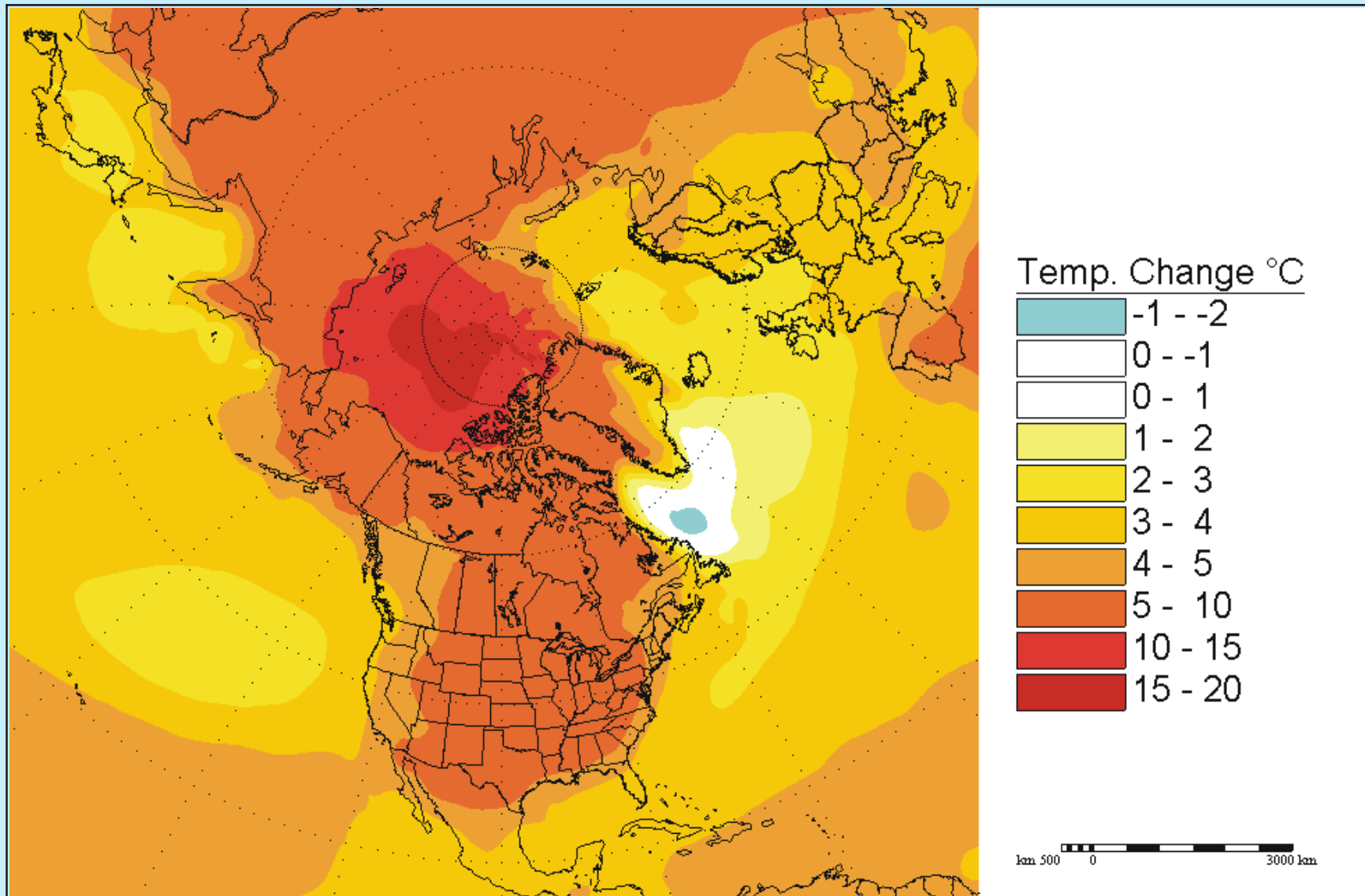
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Temperature Change Between 1975-1995 and 2080-2100

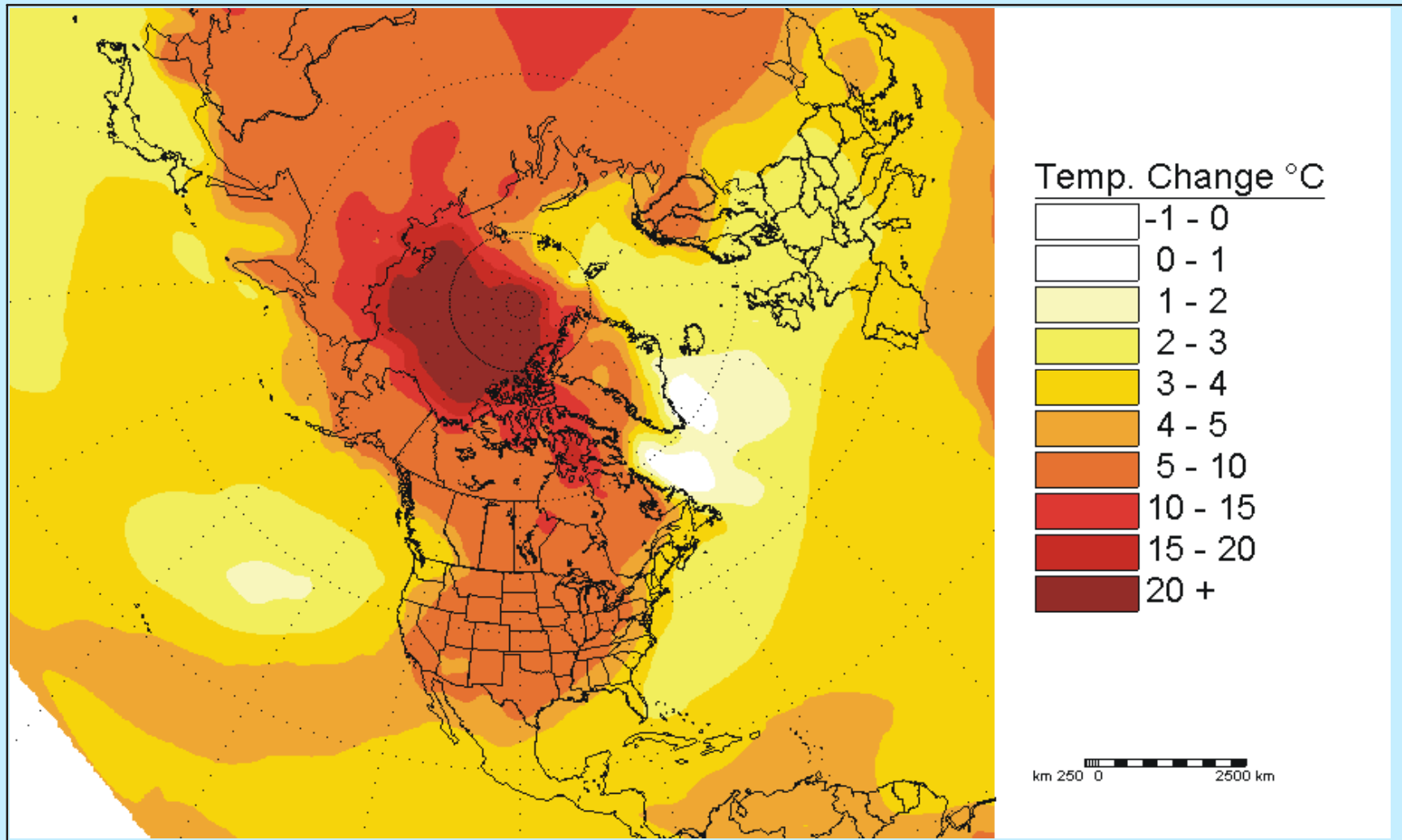
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Winter Temperature Change Between 1975-1995 and 2080-2100

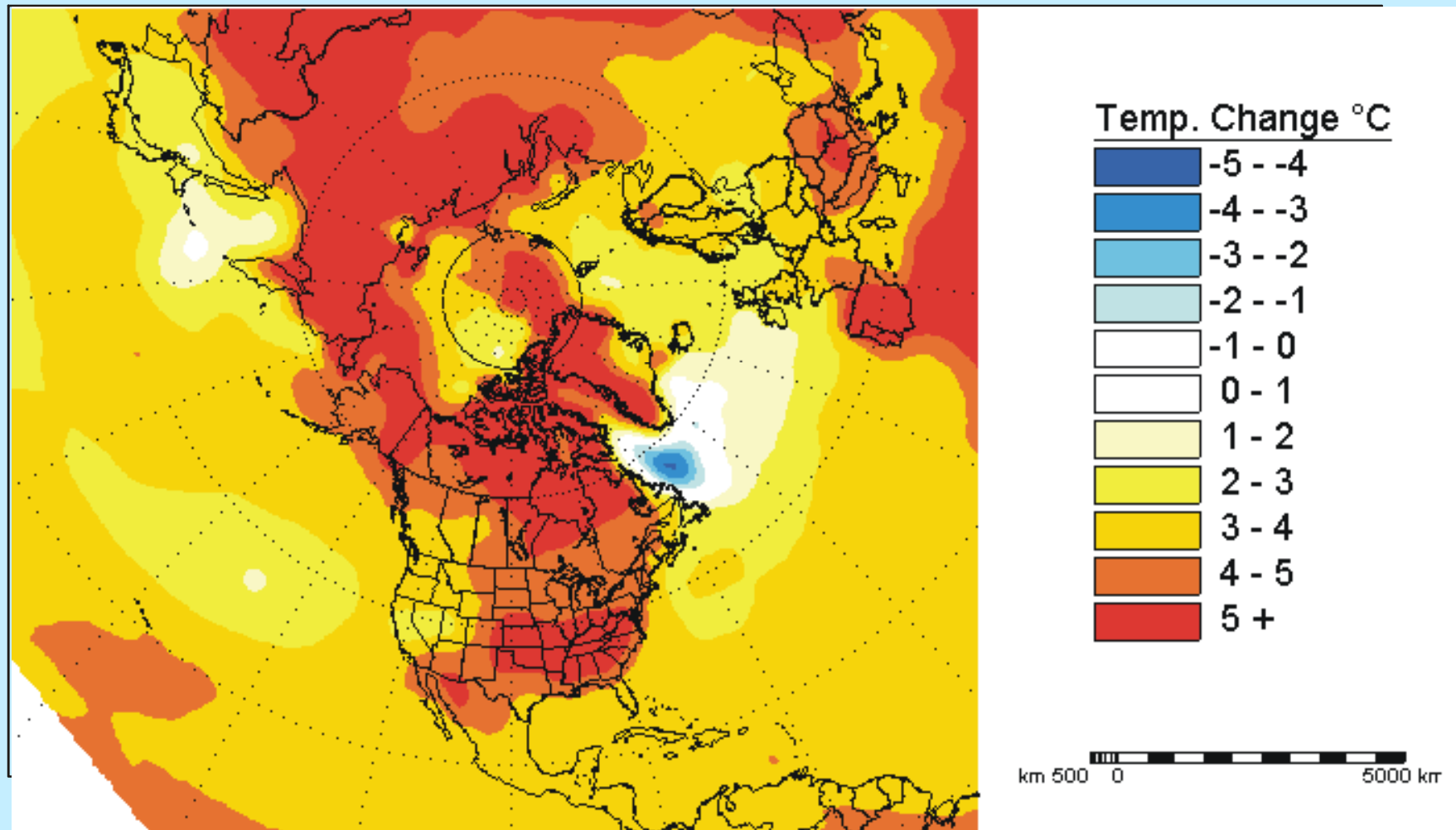
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Summer Temperature Change Between 1975-1995 and 2080-2100

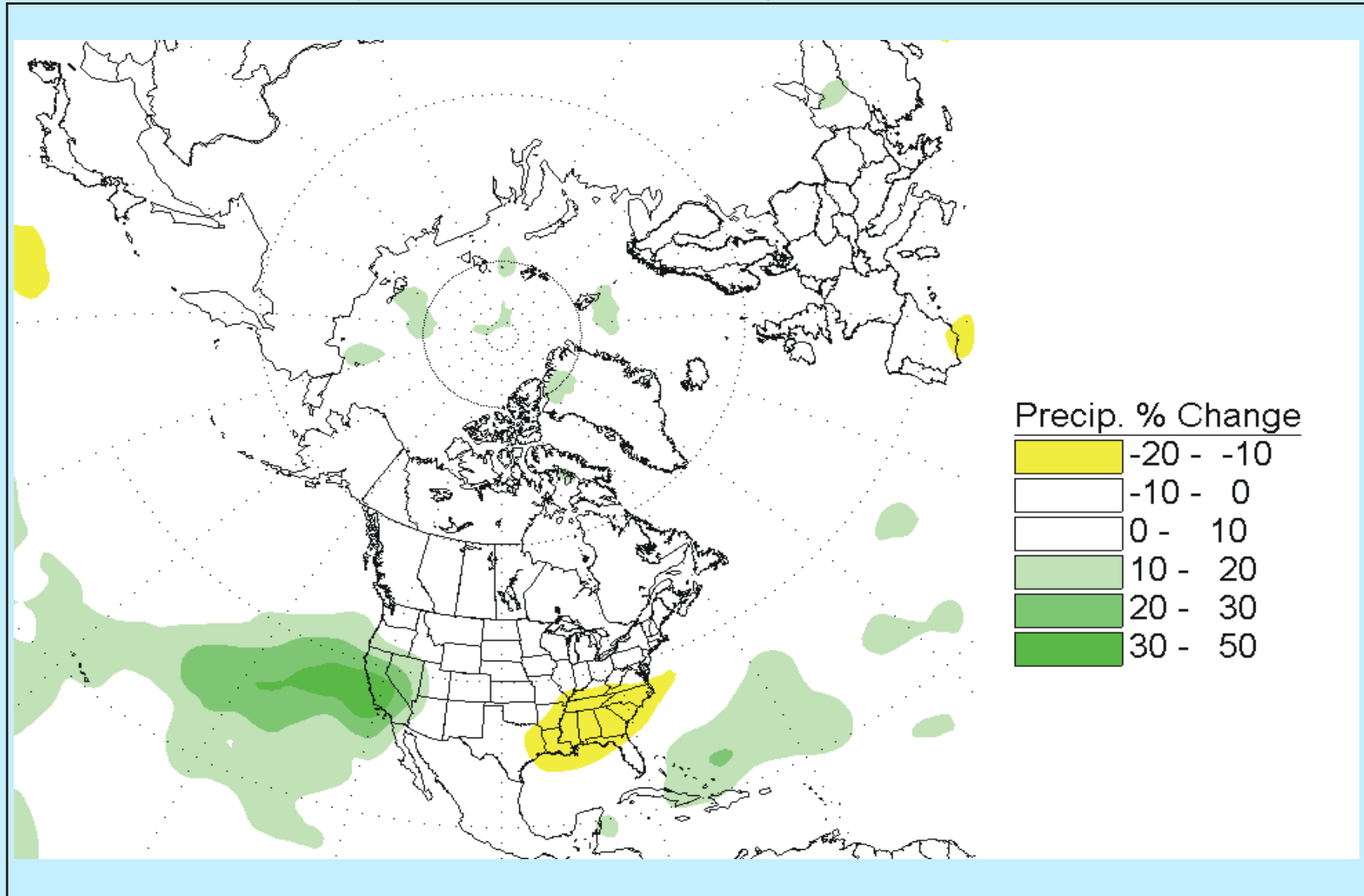
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Precipitation Change Between 1975-1995 and 2010-2030

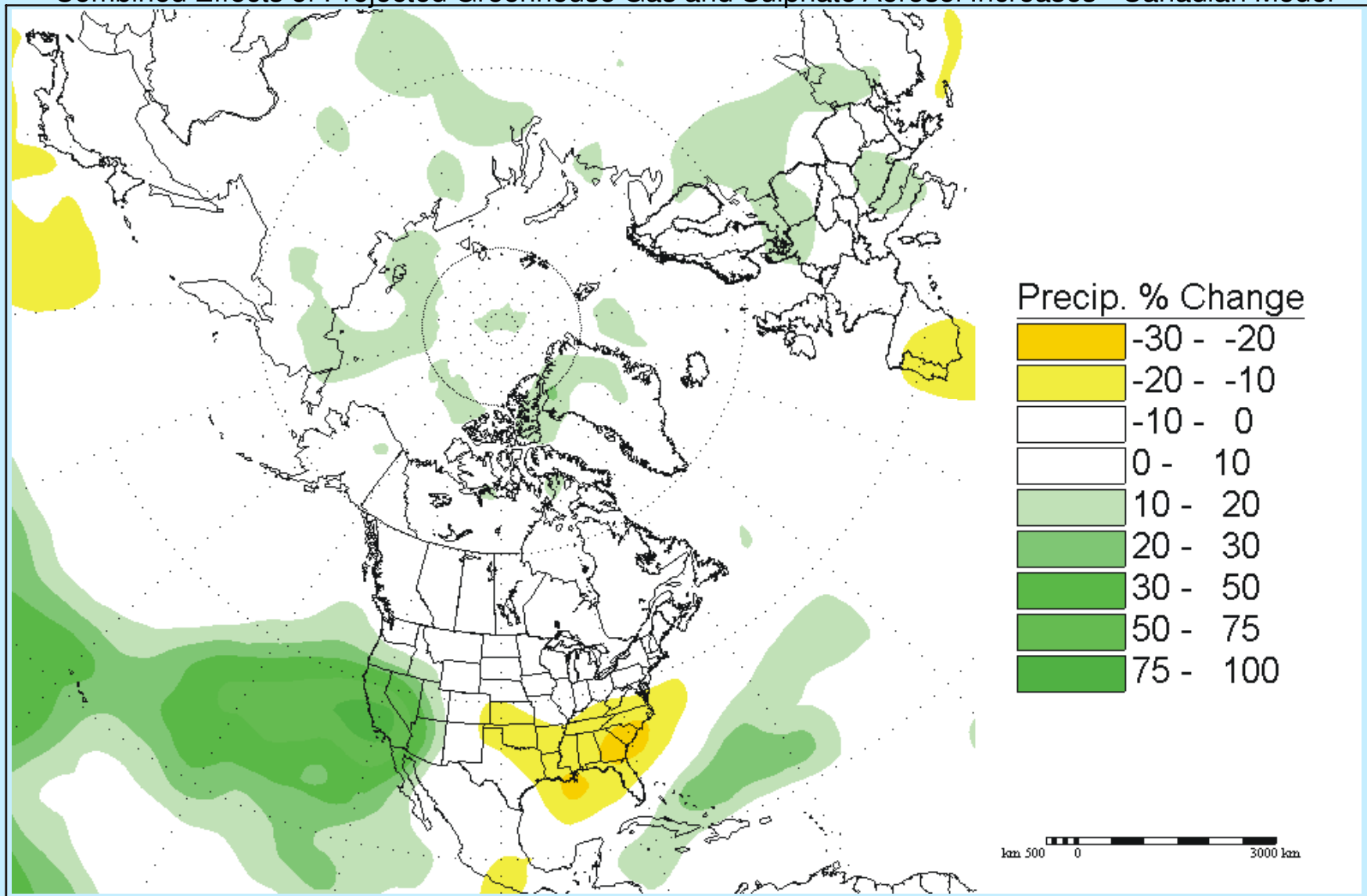
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Precipitation Change Between 1975-1995 and 2040-2060

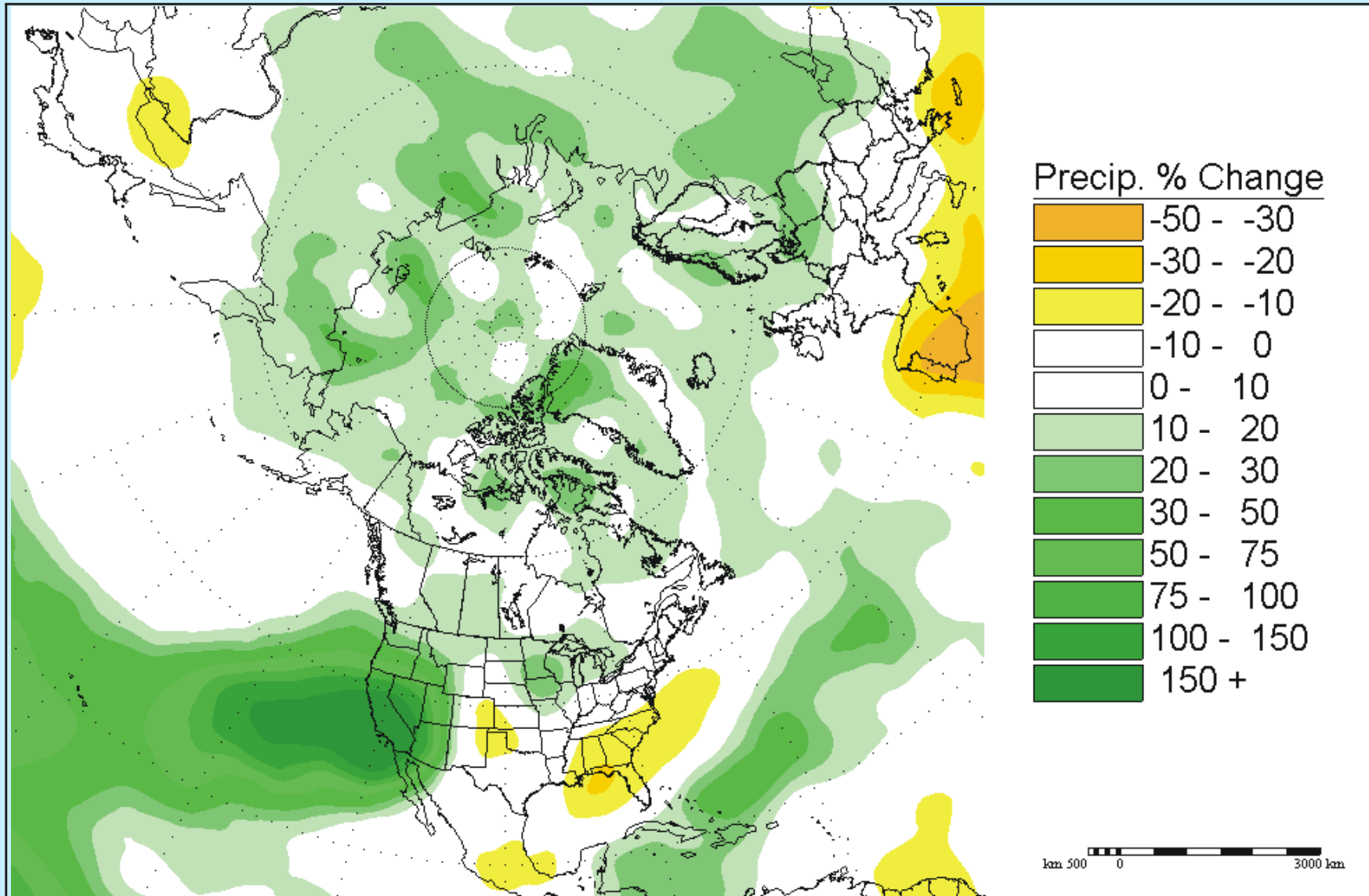
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Precipitation Change Between 1975-1995 and 2080-2100

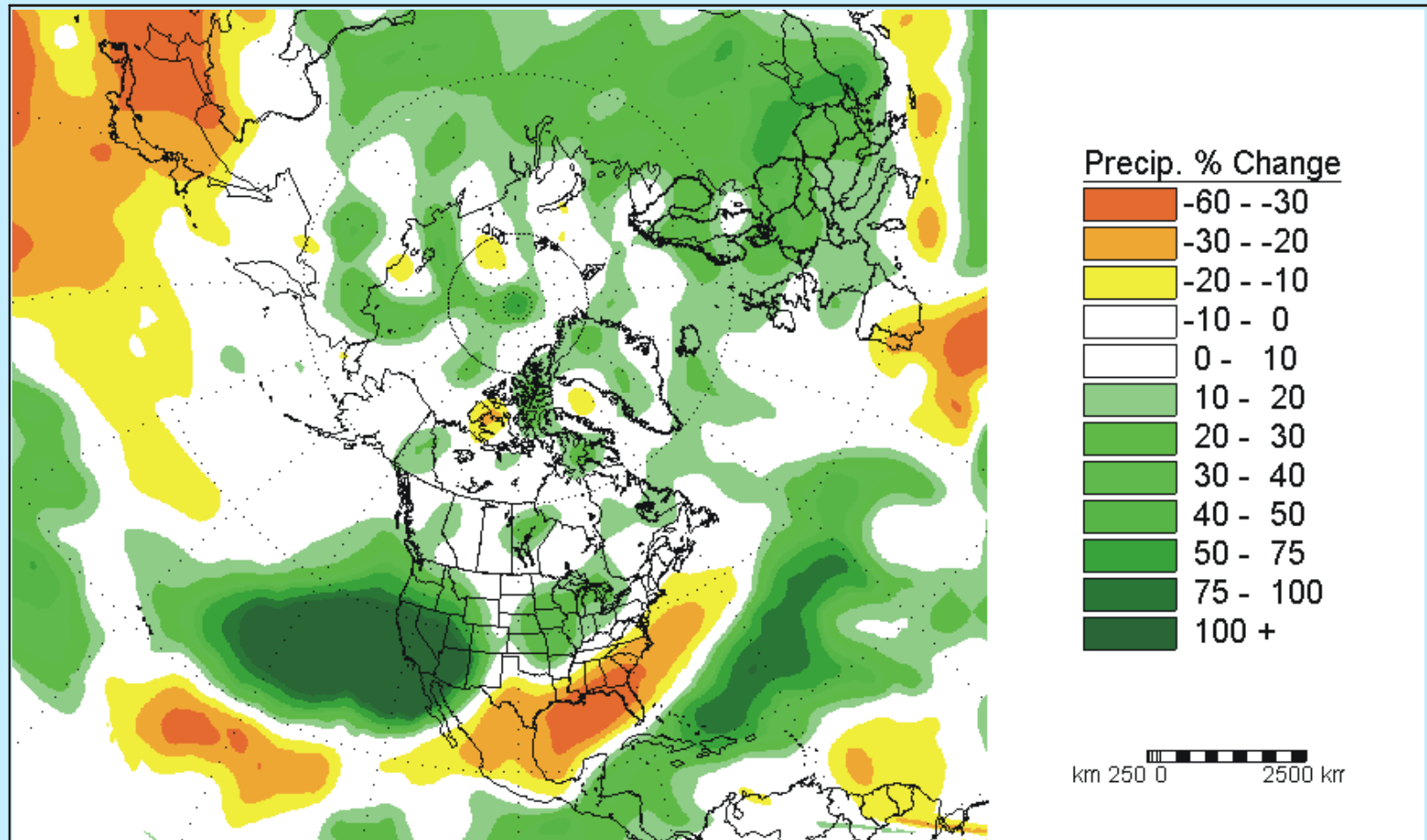
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

Projected Winter Precipitation Change Between 1975-1995 and 2080-2100

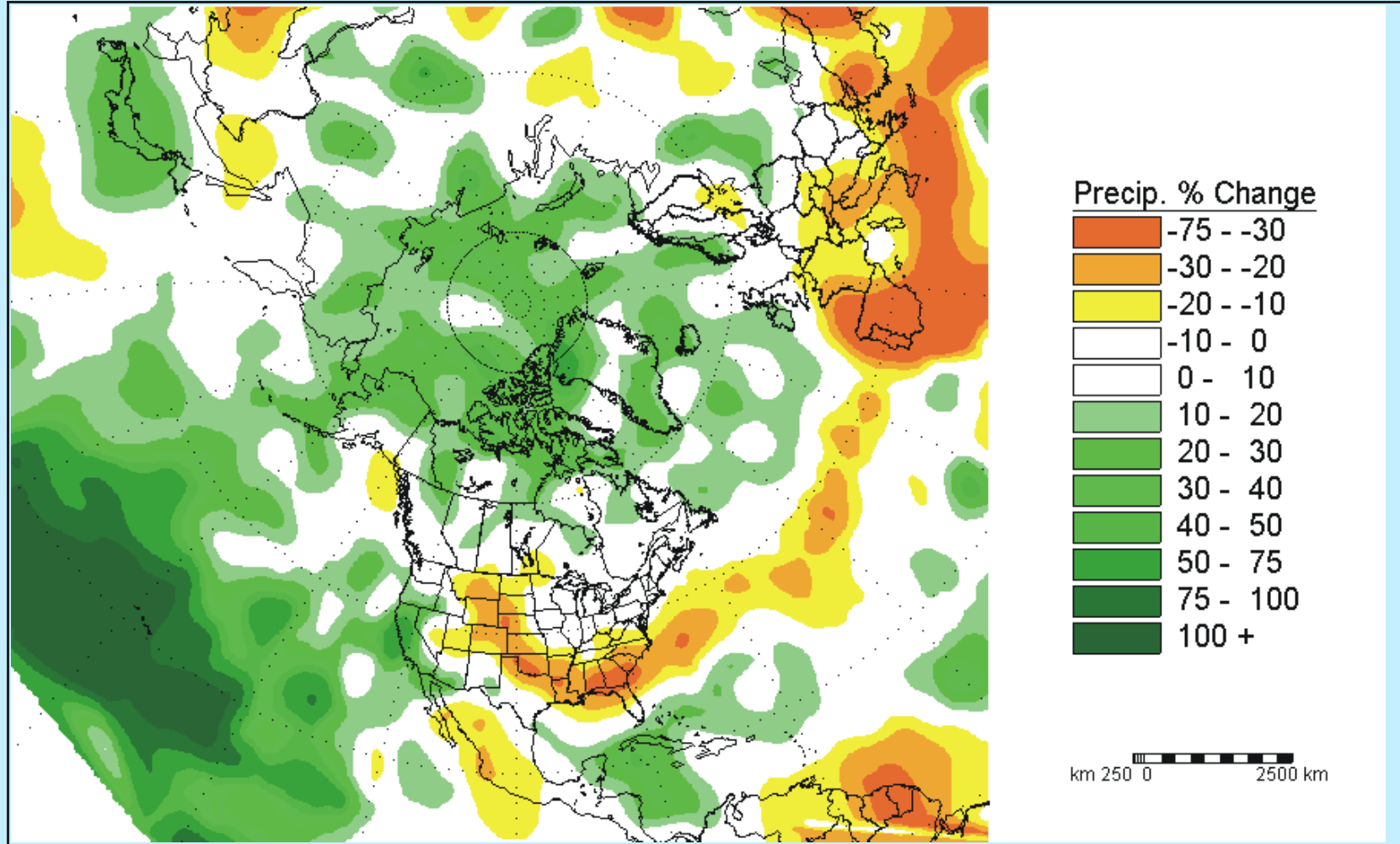
Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



Source: Meteorological Service of Canada, Environment Canada.

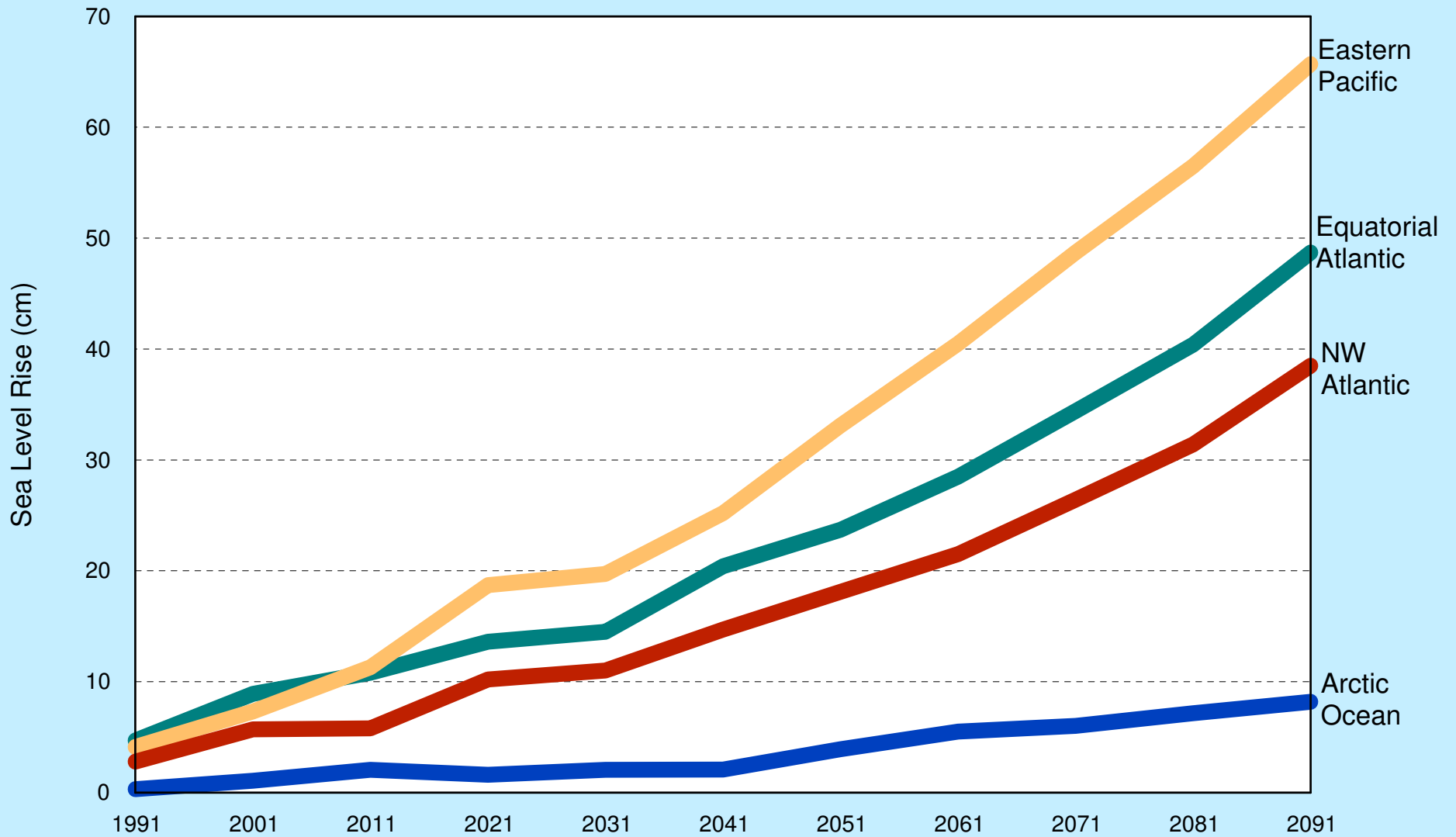
Projected Summer Precipitation Change Between 1975-1995 and 2080-2100

Combined Effects of Projected Greenhouse Gas and Sulphate Aerosol Increases - Canadian Model



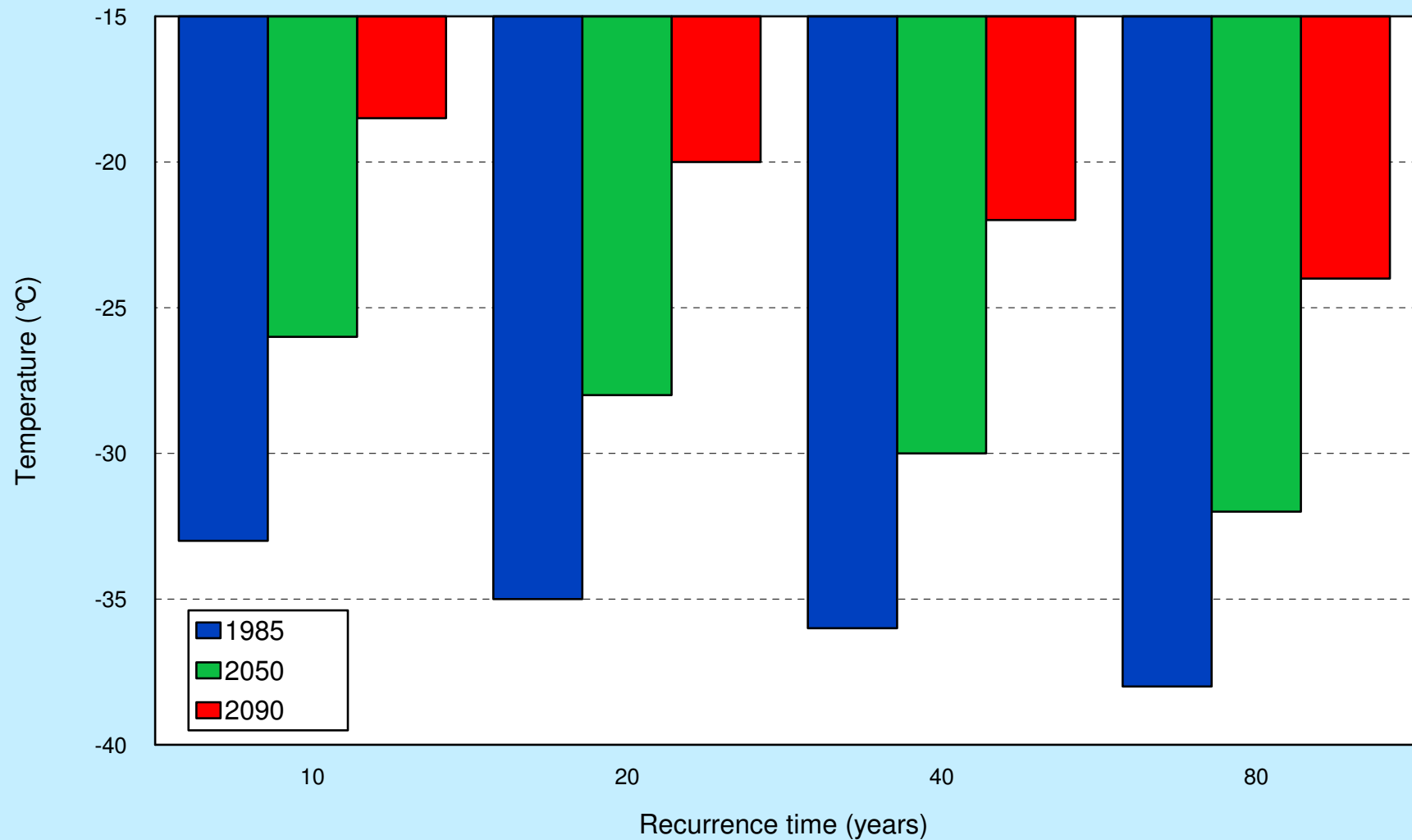
Source: Meteorological Service of Canada, Environment Canada.

Regional Changes in Sea Level



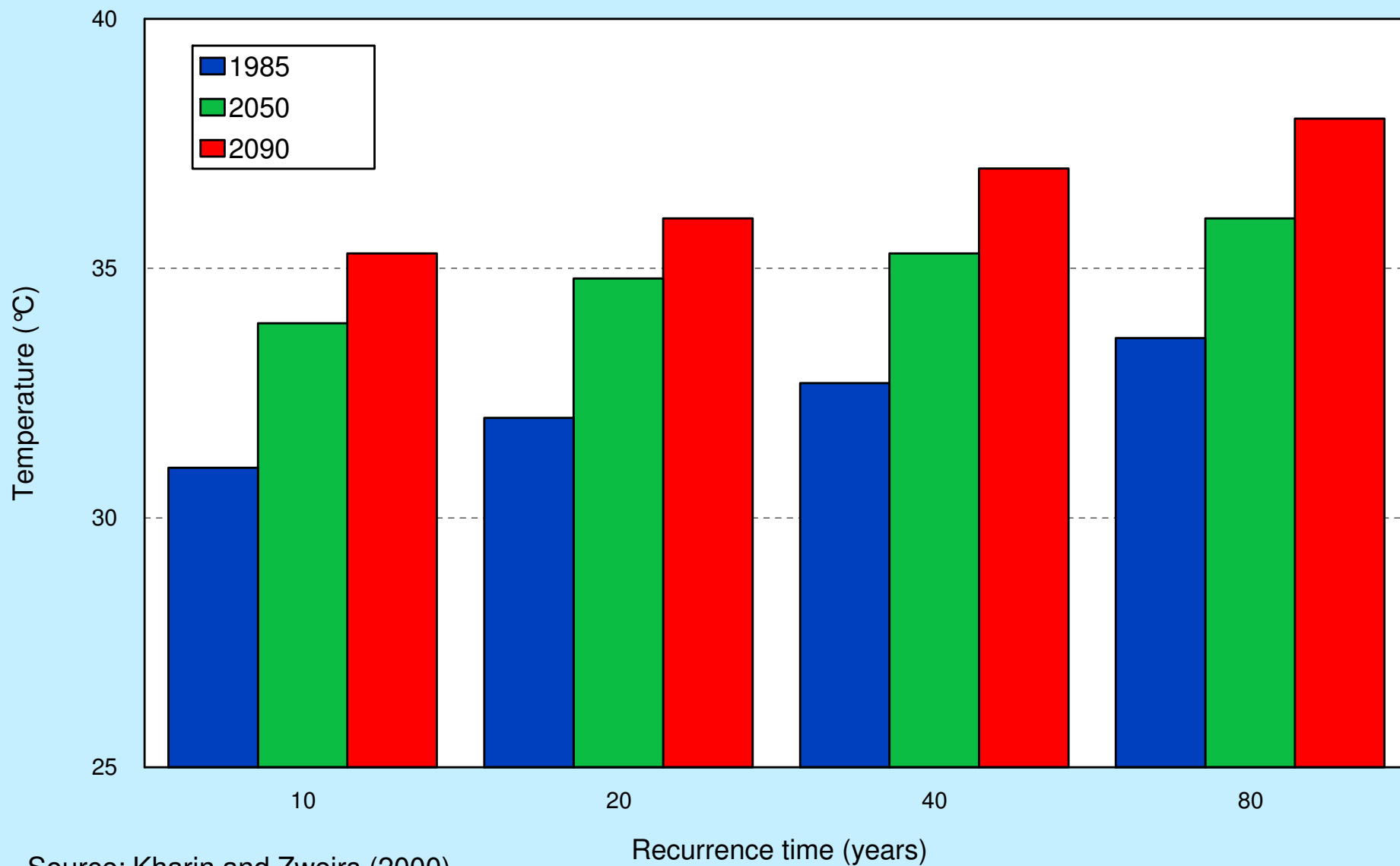
Source: CCCma

Projected Changes in Extreme Minimum Temperatures - Canada



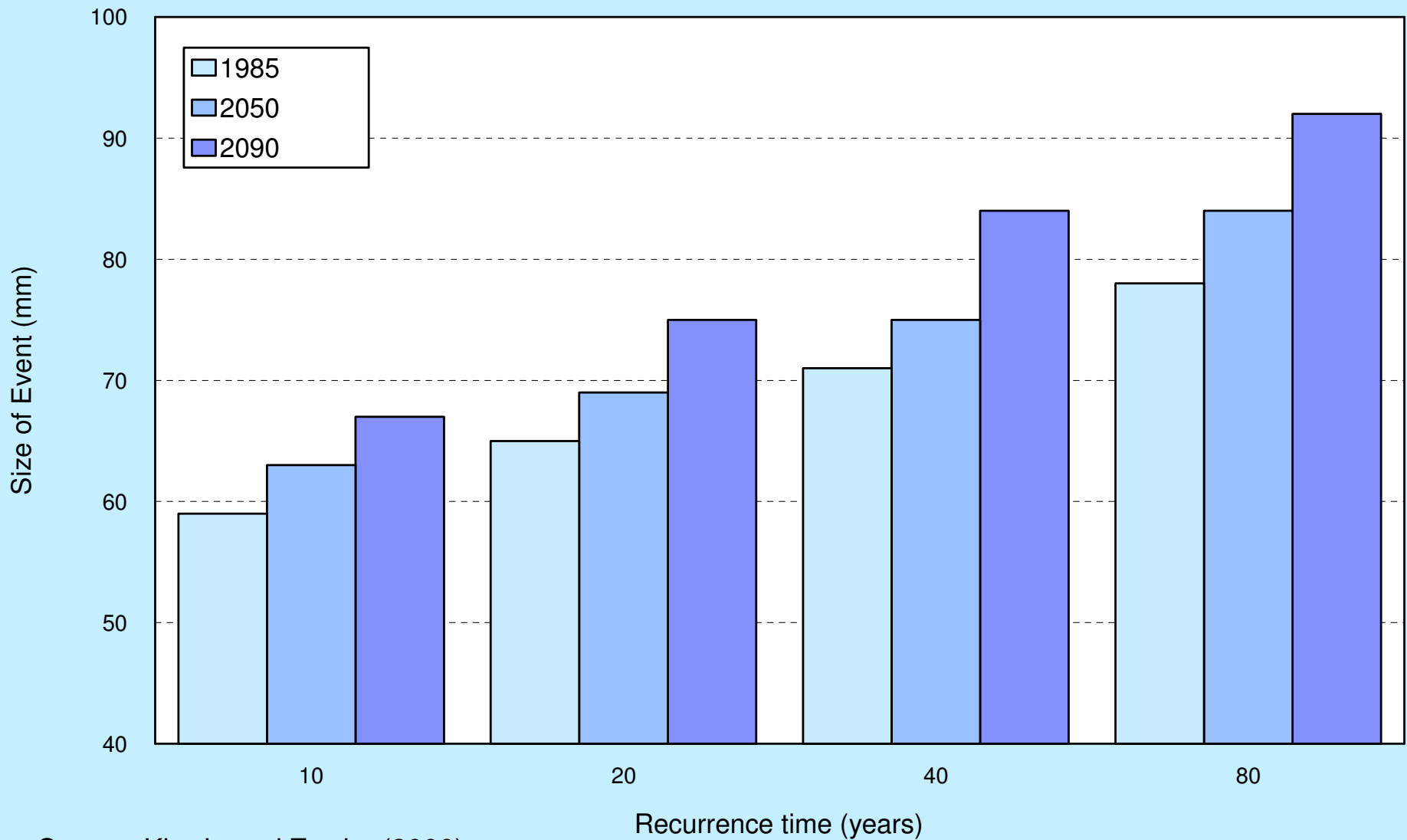
Source: Kharin and Zweirs (2000)

Projected Changes in Extreme Maximum Temperatures - Canada



Source: Kharin and Zweirs (2000)

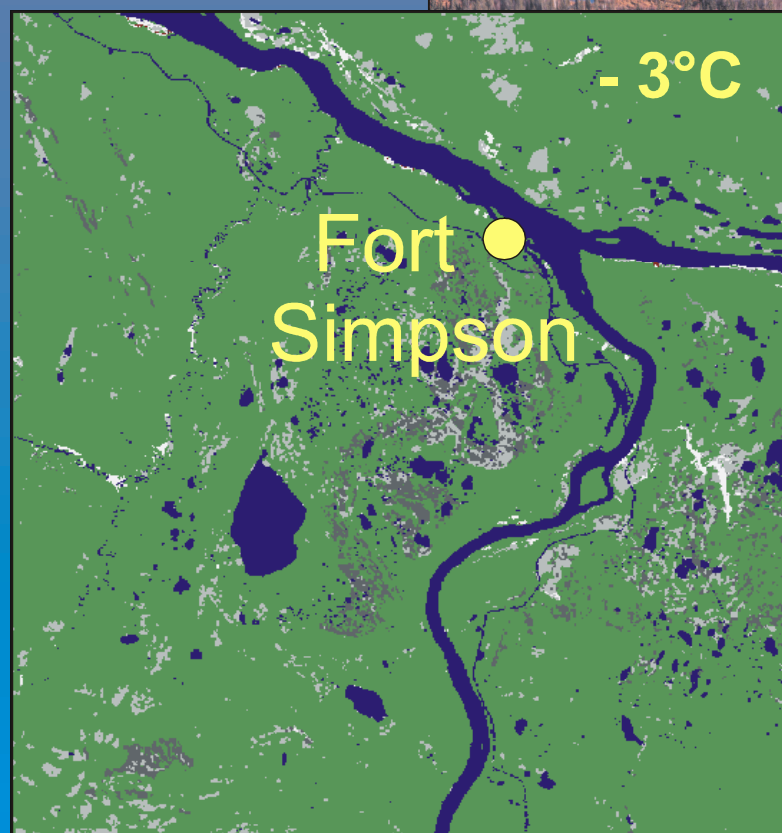
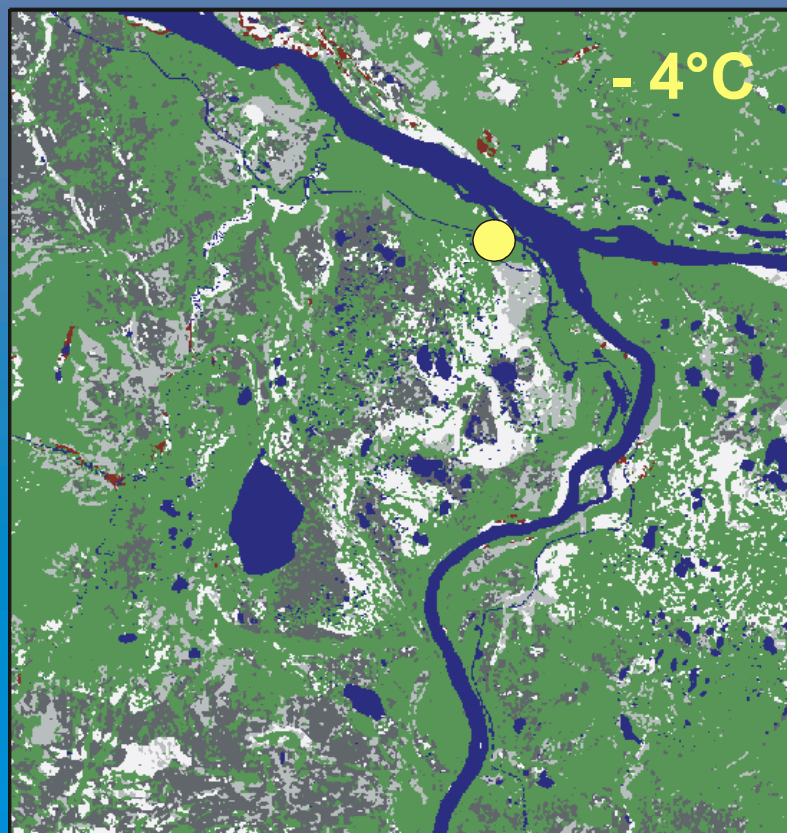
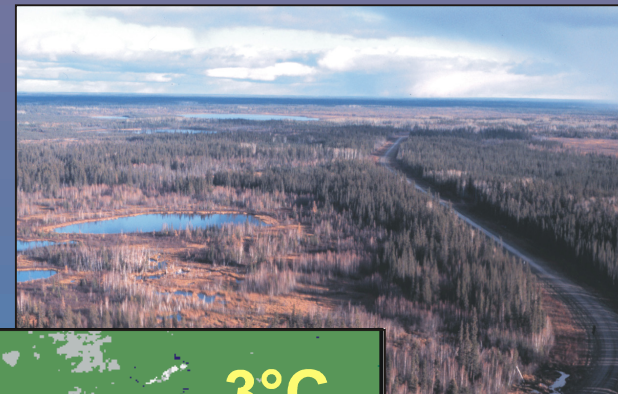
Projected Changes in Extreme Precipitation - Canada



Source: Kharin and Zweirs (2000)

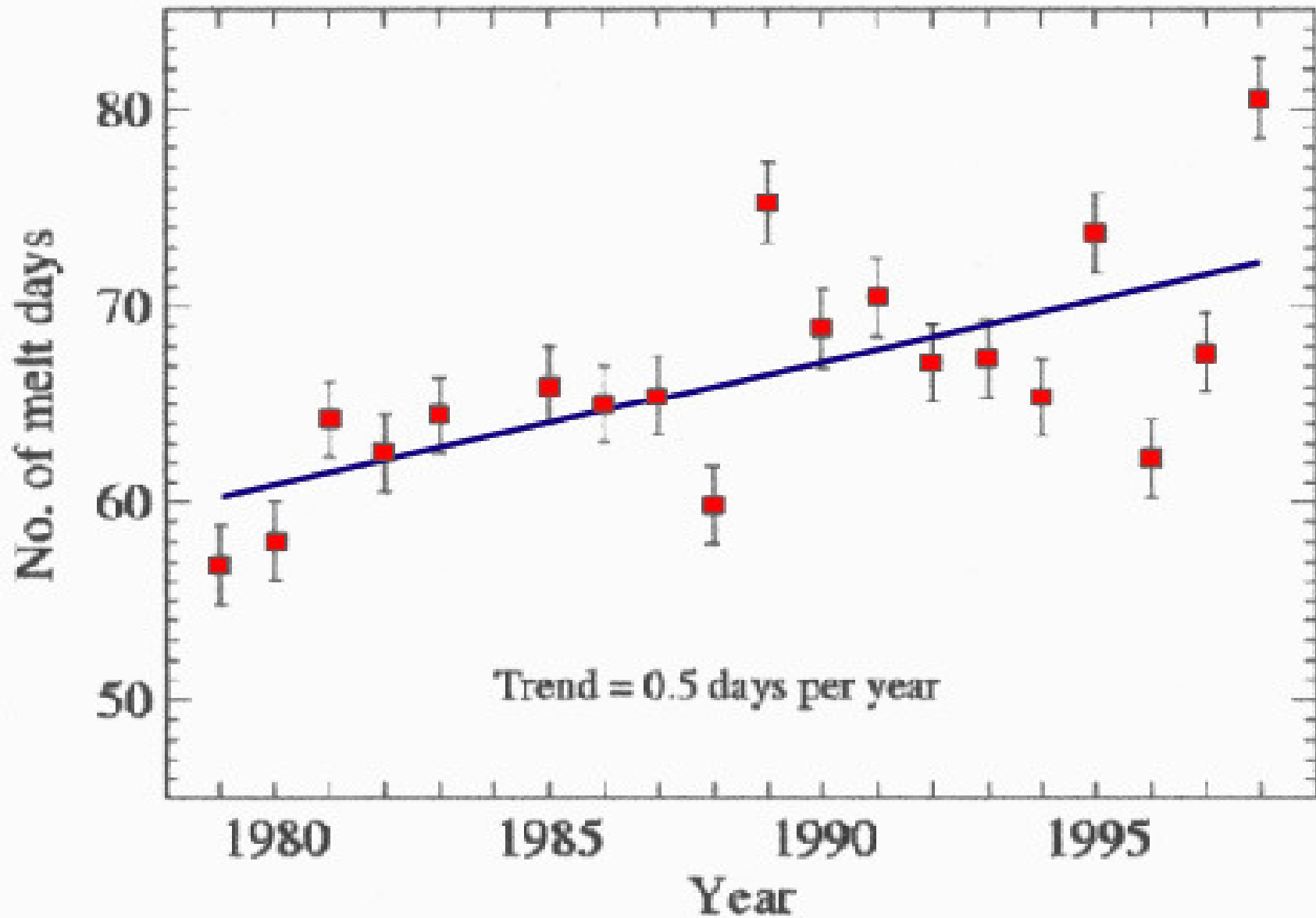
Permafrost Modelling

- impact of warming on distribution of permafrost

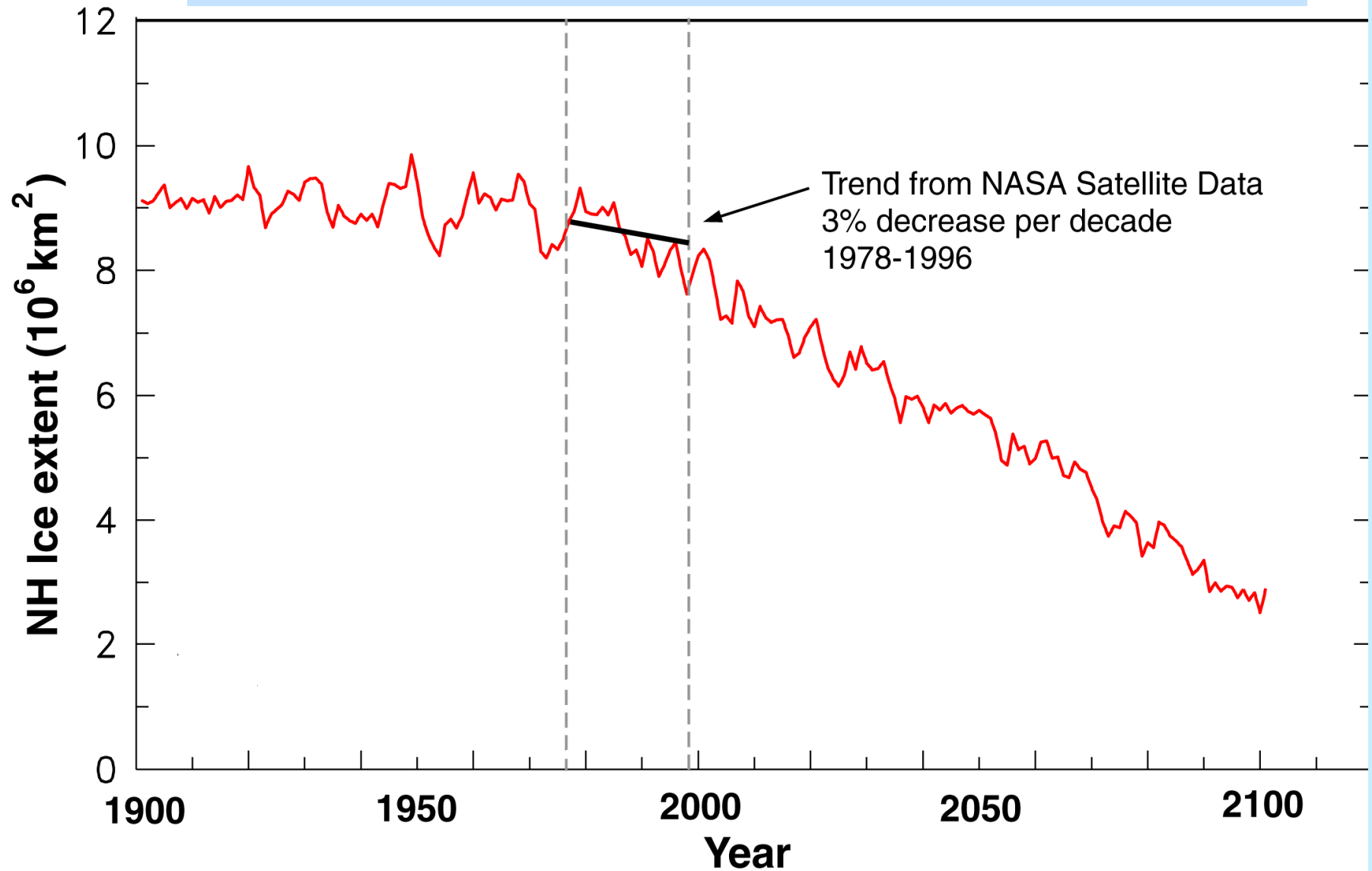


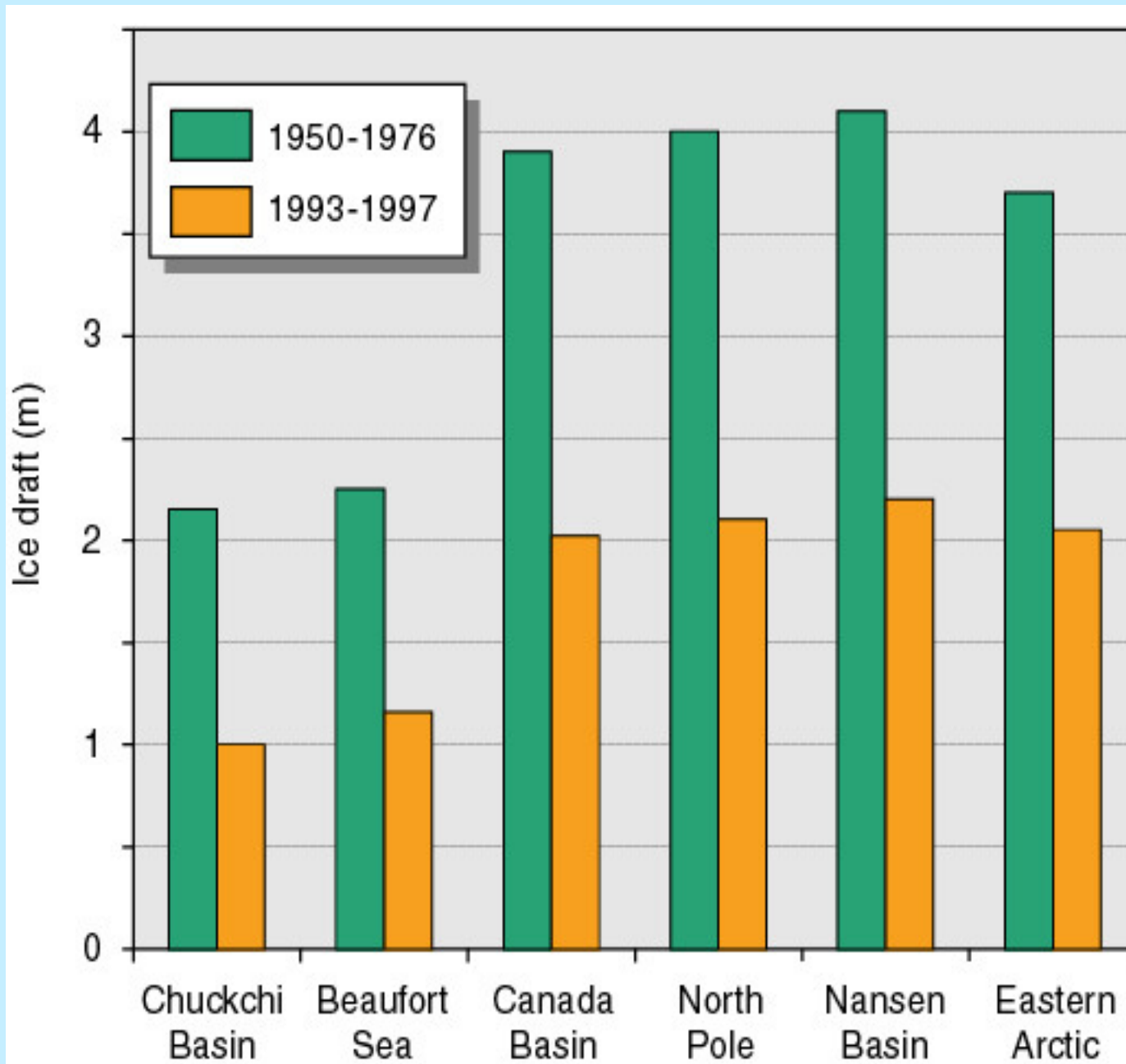
Contact: *Fred Wright, Geological Survey of Canada*

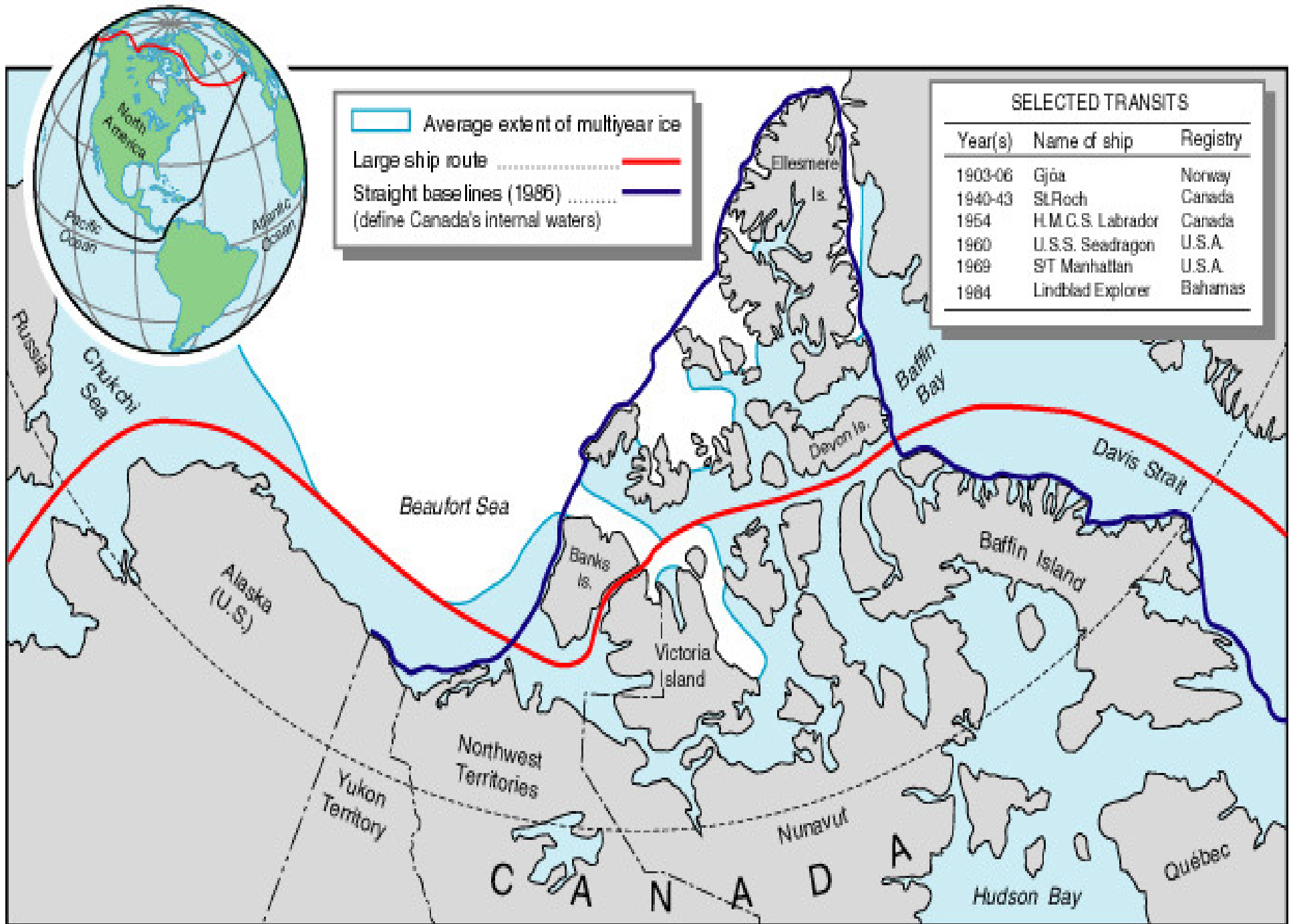
Length of Arctic sea ice melt season



Projected Changes in Arctic Sea Ice Cover







CLIMATE CHANGE IMPACTS ON CANADA

- Forestry - extensive reduction in boreal forest and large areas of forest decline
- Energy - overall decline in energy for heating and cooling
- Agriculture - seasonal moisture deficiency
- Transportation - reduction in land-based costs, longer shipping season, lower water levels

CLIMATE CHANGE IMPACTS ON CANADA (2)

- Built environment - longer summer construction season, decreased snow but increased wind loadings
- Human health - increase in respiratory disorders; water contamination through bacteria, protozoa and parasites; more environmental health refugees
- Fisheries - + in North, - in S coastal/inland

CLIMATE CHANGE IMPACTS ON CANADA (3)

- Recreation and tourism - diminished natural snow affecting both downhill and x-country; longer golf season; mountain and coastal attractions at risk; tourism at risk

CLIMATE CHANGE INSURANCE IMPACTS

- Severe weather
- Flood (including pollution)
- Water levels
- Northwest Passage
- Oil and Gas
- Credit
- Land transportation
- Agriculture

CLIMATE CHANGE LOSS DEFINITION AND DATA

- Applicability of current hours clauses to discrete events
- Absence of accurate industry catastrophe data

LOSS OCCURRENCE

- **1. The term “loss occurrence” shall mean the sum of all individual losses directly occasioned by any one disaster, accident or loss or series of disasters, accidents or losses arising out of one event which occurs within the area of one state of the United States or province or territory of Canada and states or provinces or territories contiguous thereto and to one another. However, the duration and extent of any one “loss occurrence” shall be limited to all individual losses sustained by the Company occurring during any period of 168 (one hundred and sixty eight) consecutive hours arising out of and directly occasioned by the same event except that the term “loss occurrence” shall be further defined as follows:**
 - (a) As regards windstorm, hail, tornado, hurricane, cyclone, including ensuing collapse and water damage, all individual losses sustained by the Company occurring during any period of 72 (seventy-two) consecutive hours and arising out of and directly occasioned by the same event. However, the event need not be limited to one state or province or territory or states or provinces or territories contiguous thereto.**
 - (b) As regards riot, riot attending a strike, civil commotion, vandalism and malicious mischief, all individual losses sustained by the Company occurring during any period of 72 (seventy-two) consecutive hours within the area of one municipality or county and the municipalities or counties contiguous thereto arising out of and directly occasioned by the same event. The maximum duration of 72 (seventy-two) consecutive hours may be extended in respect of individual losses which occur beyond such 72 (seventy-two) consecutive hours during the continued occupation of an assured’s premises by strikers, provided such occupation commenced during the aforesaid period.**

- **(c) as regards earthquake, (the epicentre of which need not necessarily be within the territorial confines referred to in the opening Section of this Article) and fire following directly occasioned by the earthquake, only those individual fire losses which commence during the period of 168 (one hundred and sixty-eight) consecutive hours may be included in the Company’s “loss occurrence”.**
- **(d) As regards “freeze”, only individual losses directly occasioned by collapse, breakage of glass and water damage (caused by bursting of frozen pipes and tanks may be included in the Company’s “loss occurrence”.**
- **2. Except for those “loss occurrences” referred to in Sub-Sections 1(a) and 1(b) above, the Company may choose the date and time when any such period of consecutive hours commences provided that it is not earlier than the date and time of the occurrence of the first recorded individual loss sustained by the Company arising out of that disaster, accident or loss and provided that only one such period of 168 (one hundred and sixty-eight) consecutive hours shall apply with respect to one event.**
- **3. However, as respects those “loss occurrences” referred to in Sub-Sections 1(a) and 1(b) above, if the disaster, accident or loss is of greater duration than 72 (seventy-two) consecutive hours, then the Company may divide that disaster, accident or loss into 2 (two) or more “loss occurrences” provided no 2 (two) periods overlap and no individual loss is included in more than one such period and provided that no period commences earlier than the date and time of the occurrence of the first recorded individual loss sustained by the Company arising out of that disaster, accident or loss.**
- **4. No individual losses occasioned by an event that would be covered by 72 (seventy-two) hours clauses may be included in any “loss occurrence” claims under the 168 (one hundred and sixty-eight) hours provision.**

CREDITS FOR MATERIAL

- Henry Hengeveld - Environment Canada
- Environment Canada
- Meteorological Service of Canada
- Geological Survey of Canada
- Paul Egginton - Natural Resources Canada
- NOAA (National Oceanic and Atmospheric Administration)