The 1997-98 El Niño was blamed for the deaths of 24,000 people and damage in excess of US$34 billion worldwide.

El Niño contributed to January 1998 Ice Storm in eastern Canada. Damage estimated at $5 billion and 25 deaths.
Outline

- What is El Niño
  (conditions in the tropical Pacific, how information is transmitted to Canada)

- Canadian Impact of El Niño and La Nina
  (temperature and precipitation, animation)

- Extremes in Canadian climate
  (very cold and warm days, drought, forest fires, tornadoes, wind damage)

- Canadian economic impact
  (Ice Storm 1998, agriculture, forestry, insurance industry)

- Global Impact

- Forecast of El Niño
El Niño – Tropical Pacific

Normal Conditions

Convective Circulation

Equator

Thermocline

120°E 88°W

El Niño Conditions

Equator

Thermocline

120°E 80°W
La Niña – Tropical Pacific
Monitoring El Niño

Drifting and Moored buoys plus ships of opportunity
Argo Floats

Data transmission

Measure water temperature and salinity while floating up.

Submersion

Sinks down to 2000 m.

Surface layer

Middle layer

1000 m

2000 m

Environment Environnement

Canada

ICLR April 2010
Occurrences of El Niño/La Niña
Animation of El Niño

SST ANOMALIES °C

JAN 07, 1982

JAN 05, 1997
Animation of La Niña

SST ANOMALIES °C

JAN 07, 1988

JAN 04, 1998

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How Tropical Information is Communicated (Teleconnection Pathway)
Atmospheric Circulation Changes during El Niño
Winter Temperature Impact

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Changes in Temperature Distribution

![Graph showing changes in temperature distribution with bars for El Nino, La Nina, and Normal conditions.](image)
Animation of Winter Temperature Changes during El Niño Winters
Animation of Winter Temperature Changes during La Niña Winters

La Niña - Differences in Mean Temperature (°C)

La Niña différences dans les températures moyennes (°C)
Animation of Winter Precipitation Changes during El Niño Winters
Animation of Winter Precipitation Changes during La Niña Winters
Temperature Extremes (Winter)

Percent of days above 90\textsuperscript{th} percentile (El Nino – La Nina)

Percent of days below 10\textsuperscript{th} percentile (El Nino – La Nina)
Drought on the Prairies

Standardized Precipitation

Environment Environnement
Canada Canada

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El Niño and Canadian Drought

S2 (SST)

Correlation Coefficient

-0.4
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3
0.4

Environment Environnement
Canada Canada

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El Niño and Forest Fire

S3 (SST)

Correlation Coefficient

S3 (SSR)
El Niño and Tornado in Canada

Cumulative Frequency of Tornadoes (Western Canada)

Cumulative Frequency of Tornadoes (Eastern Canada)
El Niño and Wind Damage

December

January
March 9 2002 Ontario Wind Storm

- $20 million in insured losses
- When adjusted for no claims, amounts rose to $40 million
Veracious mackerel venture north with warm El Nino waters and feed on juvenile salmon.
Likelihood of Winter Temperature Extremes (% above chance)

Environment Environnement Canada

Climatological risk is about 20%

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Likelihood of Winter Precipitation Extremes (% above chance)

El Nino

La Nina

Climatological risk is about 20%
Canadian El Niño/La Niña Impact

- Heating cost below normal, an average saving of $200 per household
- Export of natural gas to eastern U.S. down during El Niño winters
- More than usual avalanches in B.C. More fatalities in El Niño winters
- Premature thawing of ice roads restricting logging operations and transportation of goods to northern localities
Canadian El Niño/La Niña Impact

- Landslides in B.C. washing roads and rail lines restricting transportation
- Mild weather allows for petroleum and oil drilling to continue well into winter
- Lack of snow exacerbates droughty conditions on the Prairies. 1999-2005 cost estimated at over 6 billion dollars
- Reduced municipal snow clearing results in savings of nearly 100 million dollars
Canadian El Niño/La Niña Impact

- Number of fatalities as people venture on thin lake ice
- Winter sport industry adversely affected due to lack of snow
- Ice wine industry adversely affected by mild temperatures, loss of 15 million dollars during 1997-98 El Niño
Canadian El Niño/La Niña Impact

- The Saguenay floods of 1996 followed on the heels of La Niña and were the most devastating in Canadian history, resulting in 10 deaths, $800 million in damages, 1,718 houses and 900 cottages destroyed or damaged.

- The two-day rainfall was equivalent to the volume of water that tumbles over Niagara Falls in four weeks.
Global Impact of El Niño/La Niña

El Niño

La Niña
Global Economic Impact

- El Niño contributed to record global warmth in 1998. El Nino contributes to global temperature by about 0.02 Celsius degree.


- El Niño driven heavy rains in the arid American southwest produce abundant plants leading to increased rodent population, thus creating increased risk for the outbreak of deadly hantavirus.
Global Economic Impact

- 1997-98 El Niño produced 10% reduction in energy demand with a saving of $5 billion in the U.S.

- El Niño reduces potential for property damage from hurricane on the American east coast – a saving of $1 billion
El Niño Forecast

Current El Nino will transition to neutral conditions by summer 2010

Environment Canada

ICLR April 2010
Canadian Forecast during El Niño

Skilful forecast during EL Nino and La Nina winters in Canada
Data from Emergency Disasters Data Base (EM-DAT 2003)

Climate anomalies associated with losses are not greater during El Nino (University of Columbia, N.Y.)
Summary

- Second only to the seasonal cycle, El Niño and La Niña disrupt the natural rhythm of climate
- El Niño affects many sectors of the Canadian economy
- El Niño and La Niña events lead to greater predictability and potentially socioeconomic outcomes
- Prudent use of climate forecasts could mitigate adverse impacts and could transform years of El Niño extremes into least costly to life and property
Web site

Much more information on

- **El Niño**

- **La Niña**
Thank You