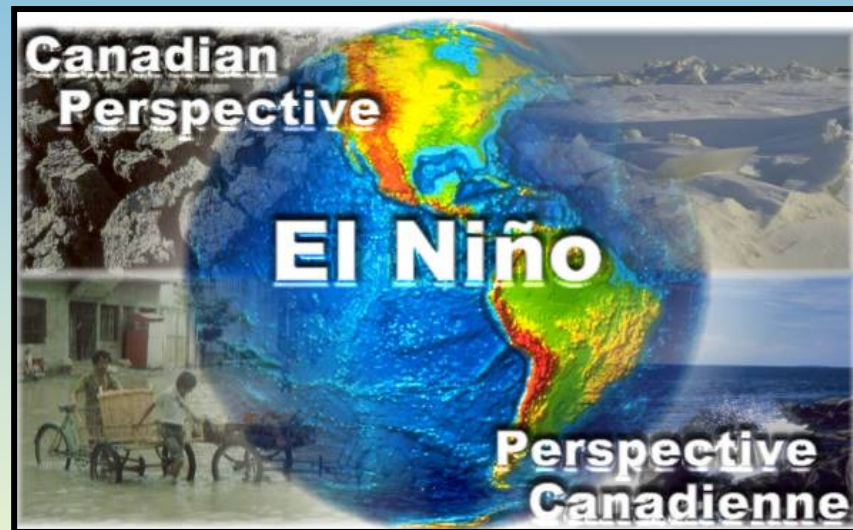
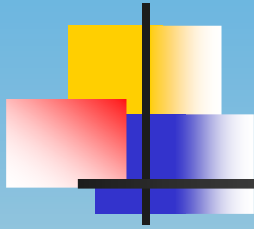


# El Niño -Southern Oscillation

Amir Shabbar, Environment Canada



- ❑ 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.



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search ID: hsc0531

"CURTIS, I WANT YOU TO FIND A WAY TO BLAME ALL THIS ON EL NINO."

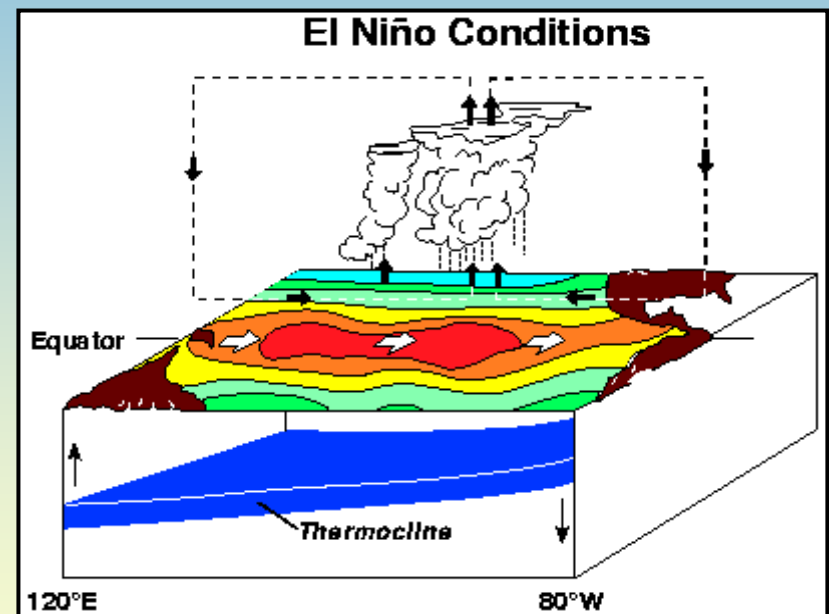
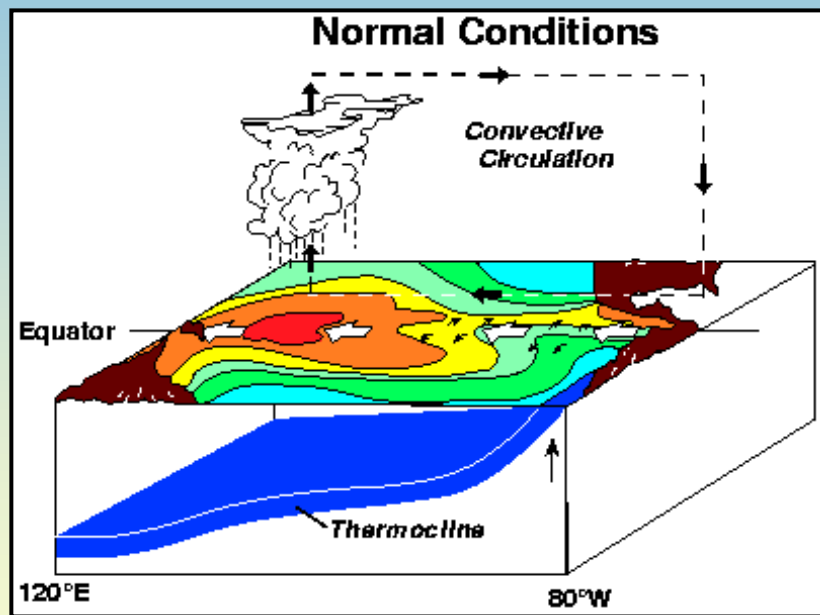


# Outline

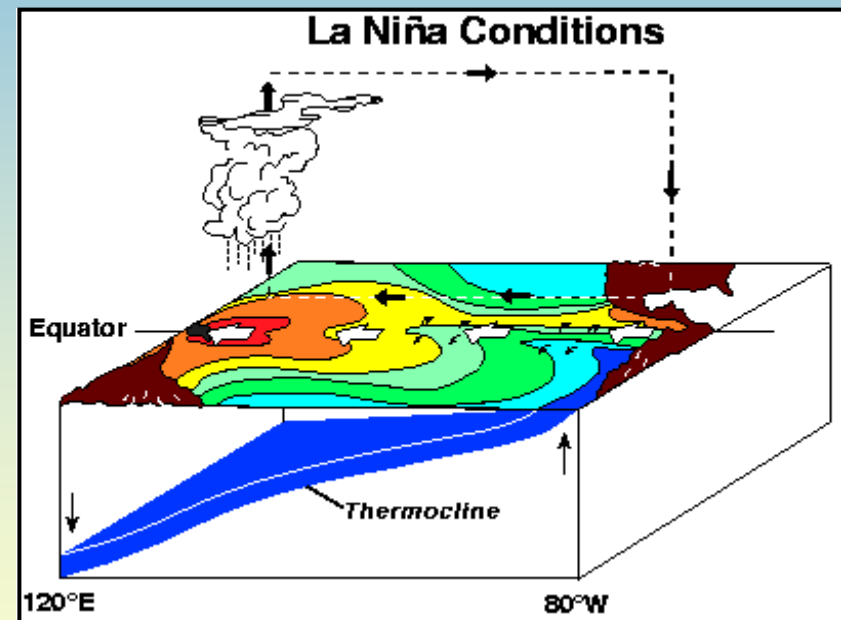
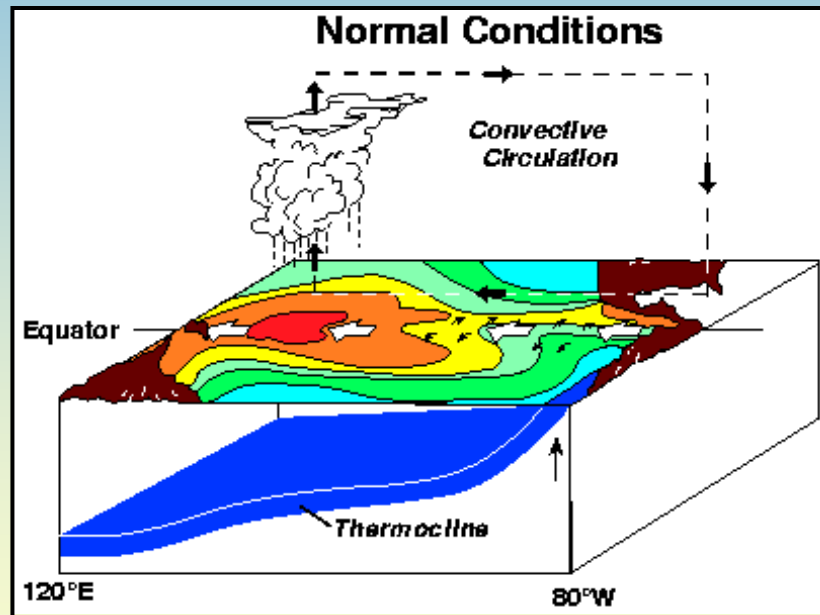
- ❑ **What is El Niño**  
(conditions in the tropical Pacific, how information is transmitted to Canada)
- ❑ **Canadian Impact of El Niño and La Nina**  
(temperature and precipitation, animation)
- ❑ **Extremes in Canadian climate**  
(very cold and warm days, drought, forest fires, tornadoes, wind damage)
- ❑ **Canadian economic impact**  
(Ice Storm 1998, agriculture, forestry, insurance industry)
- ❑ **Global Impact**
- ❑ **Forecast of El Niño**



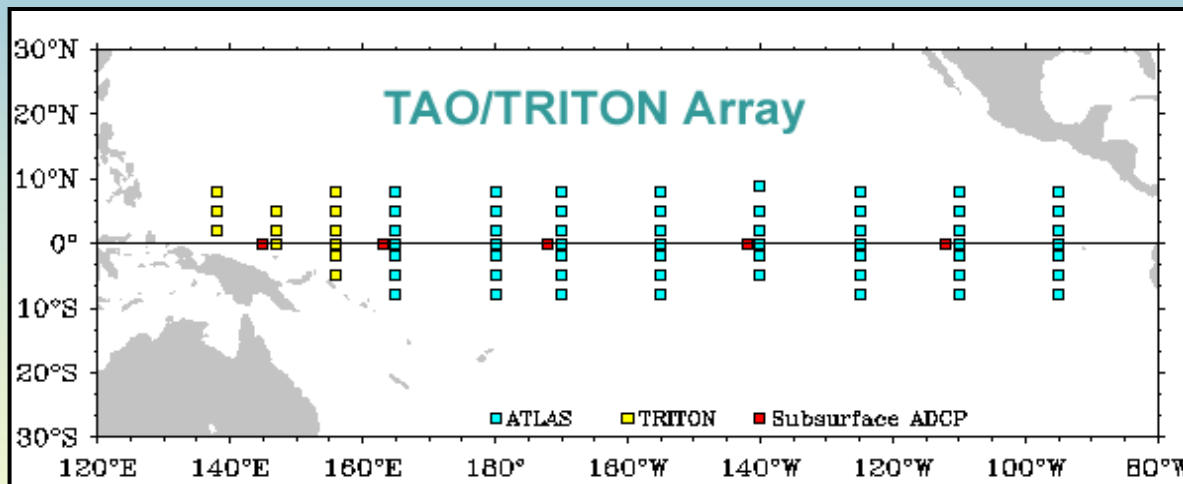
# El Niño – Tropical Pacific



# La Niña – Tropical Pacific



# Monitoring El Niño



Drifting and Moored buoys plus ships of opportunity

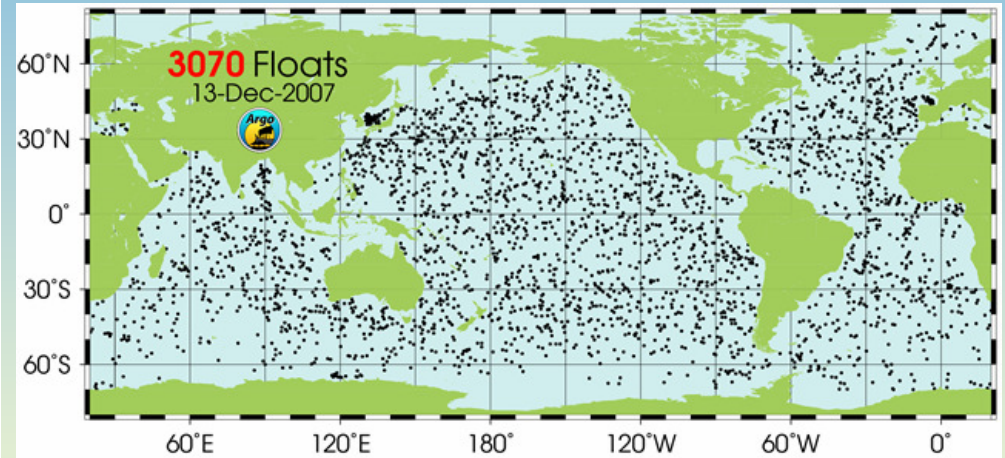
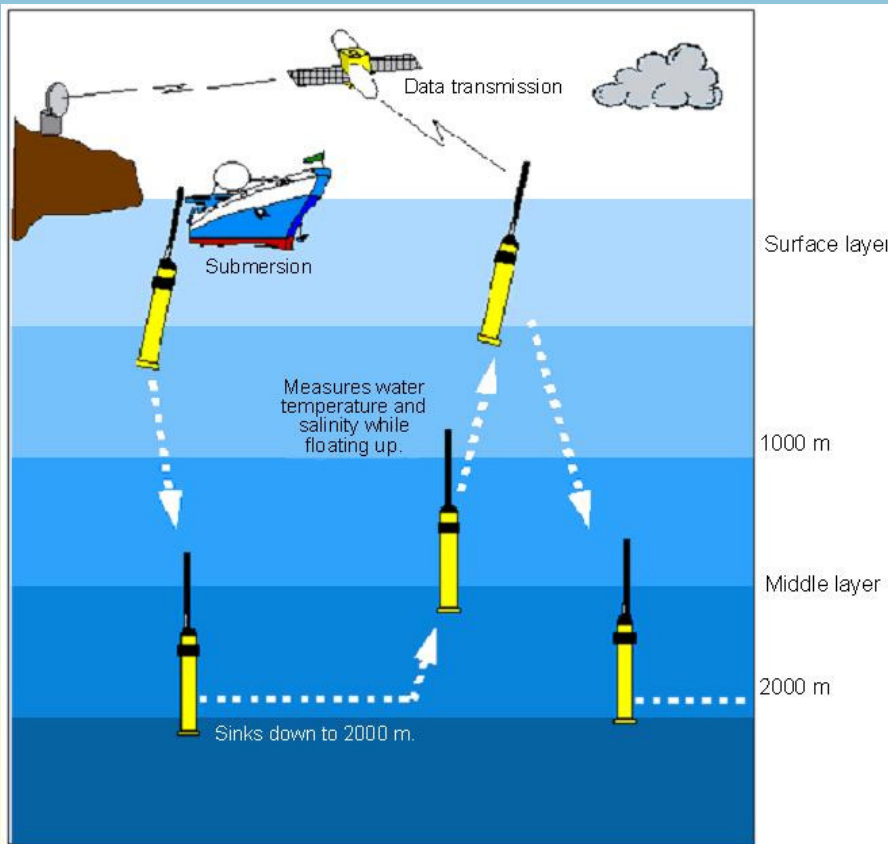


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# Argo Floats

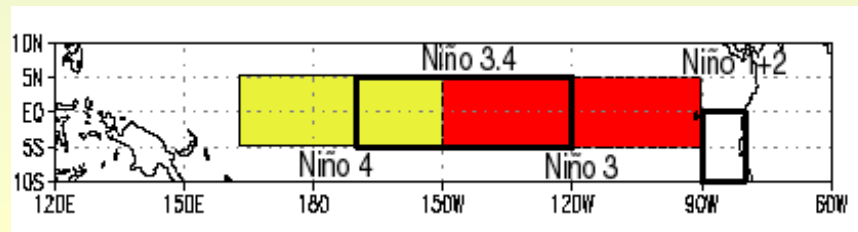
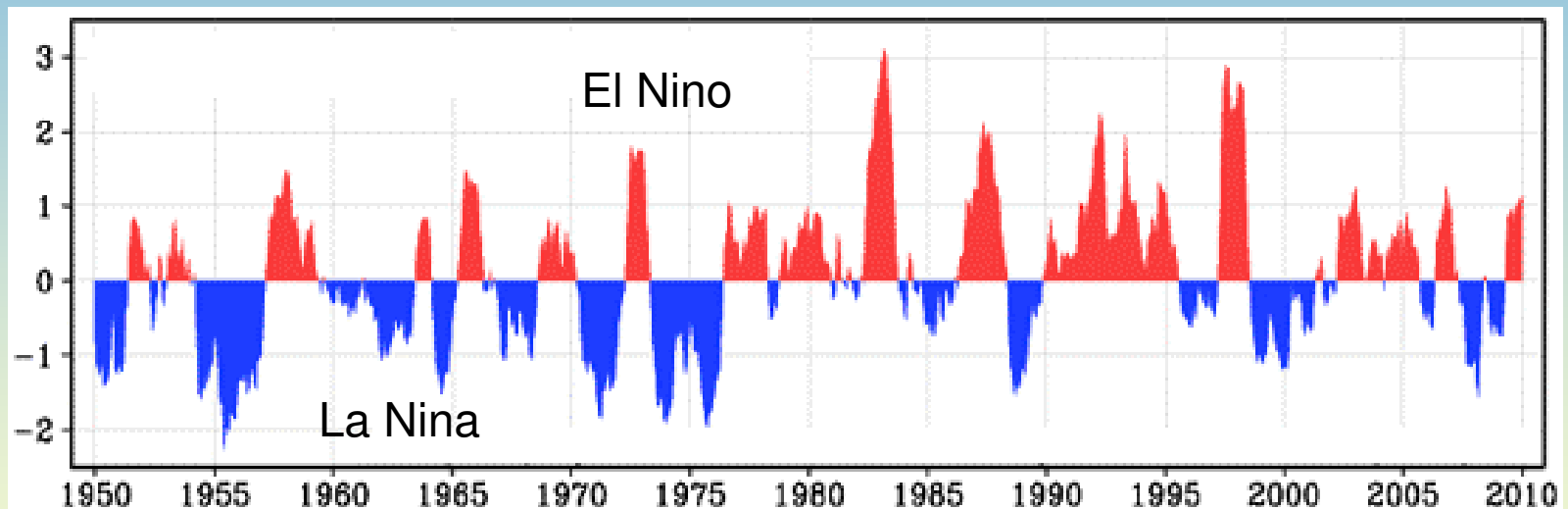


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# Occurrences of El Niño/La Niña



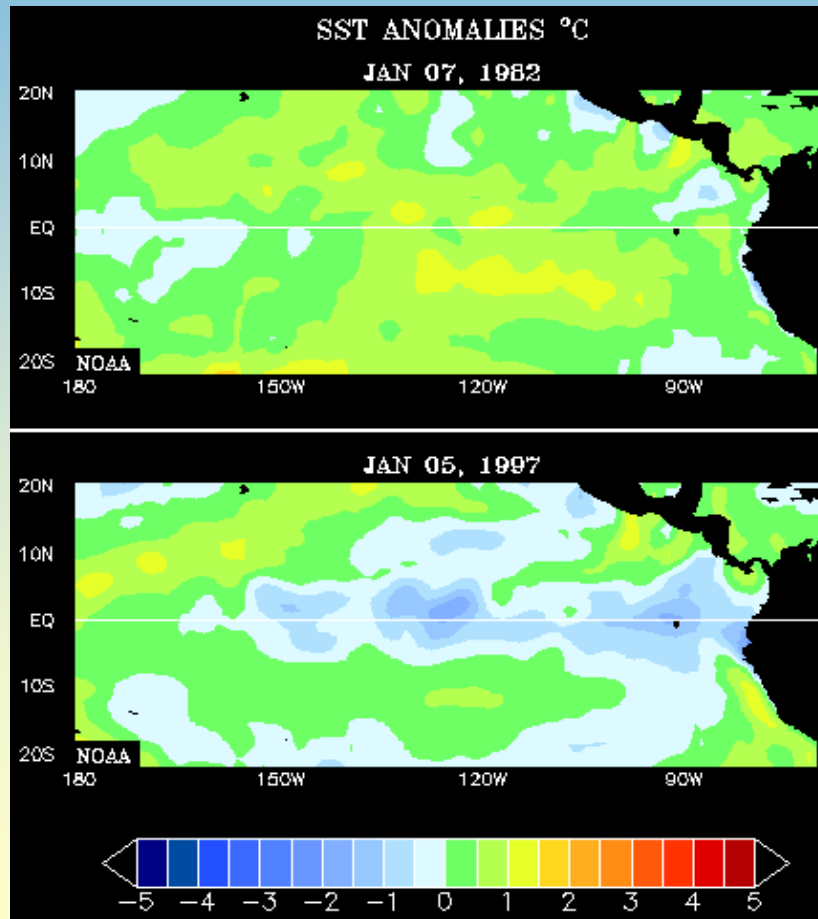
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# Animation of El Niño

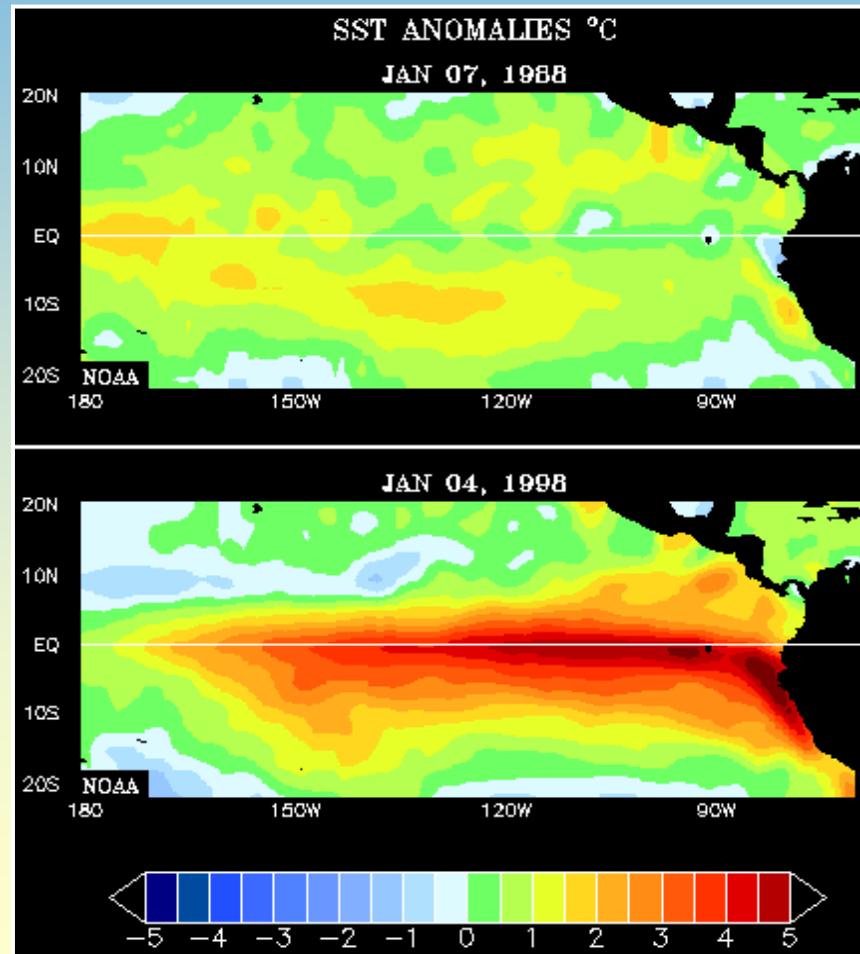


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# Animation of La Niña

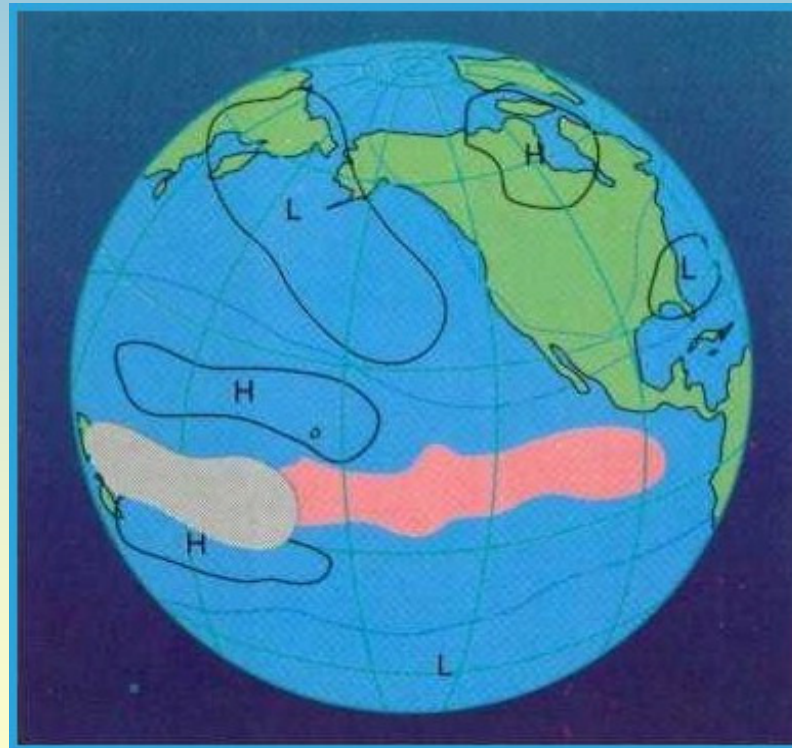


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# How Tropical Information is Communicated (Teleconnection Pathway)

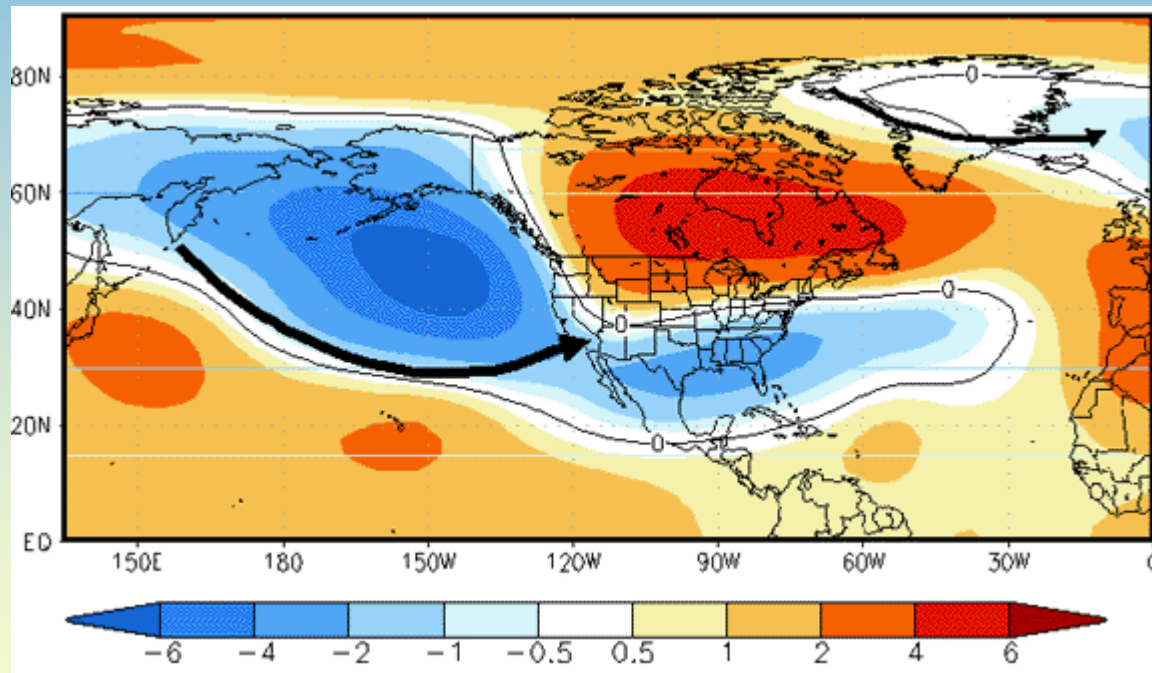


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# Atmospheric Circulation Changes during El Niño

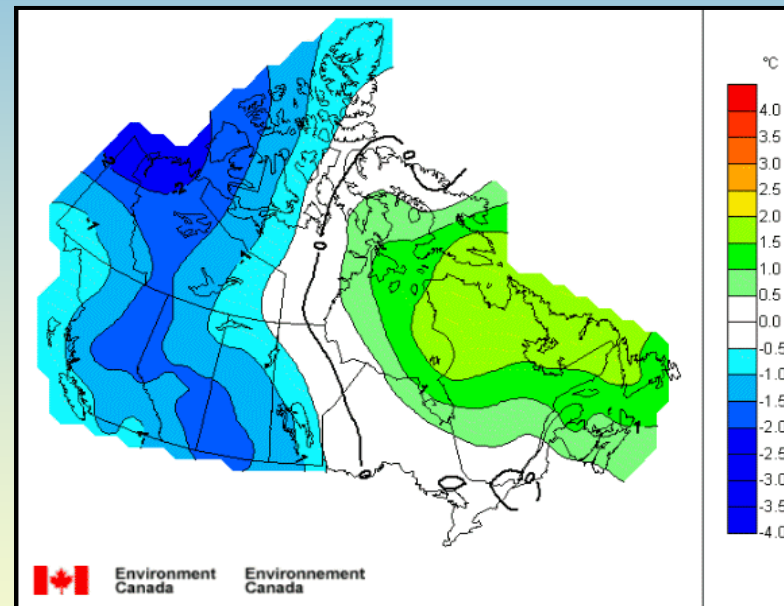
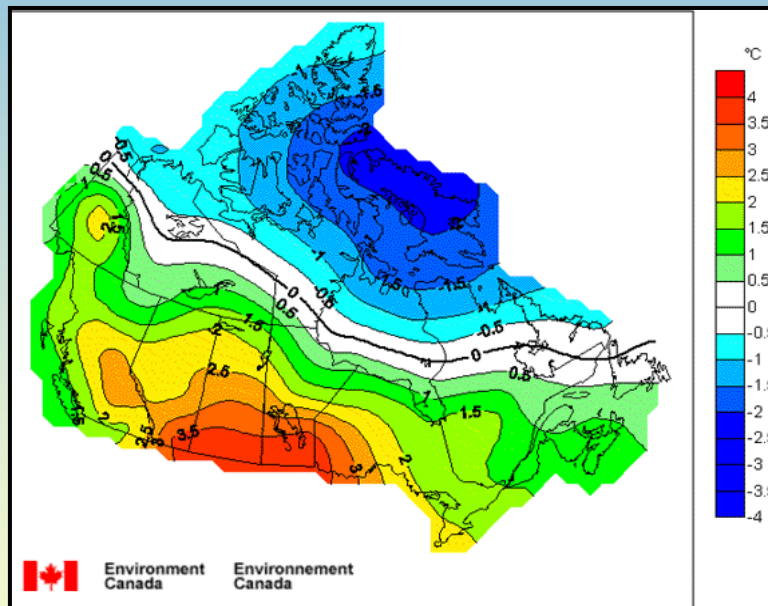


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# Winter Temperature Impact

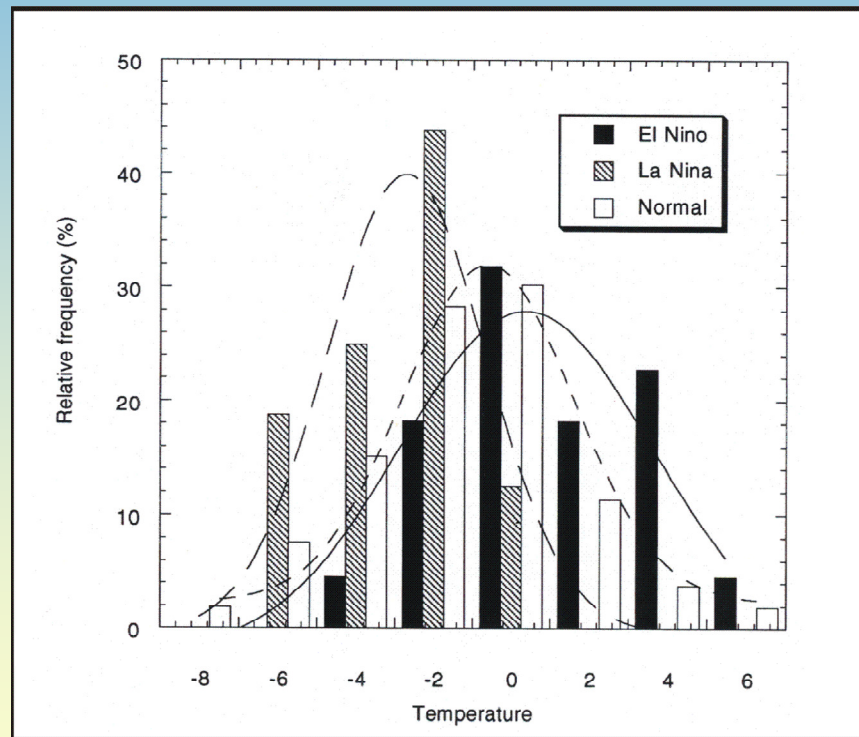


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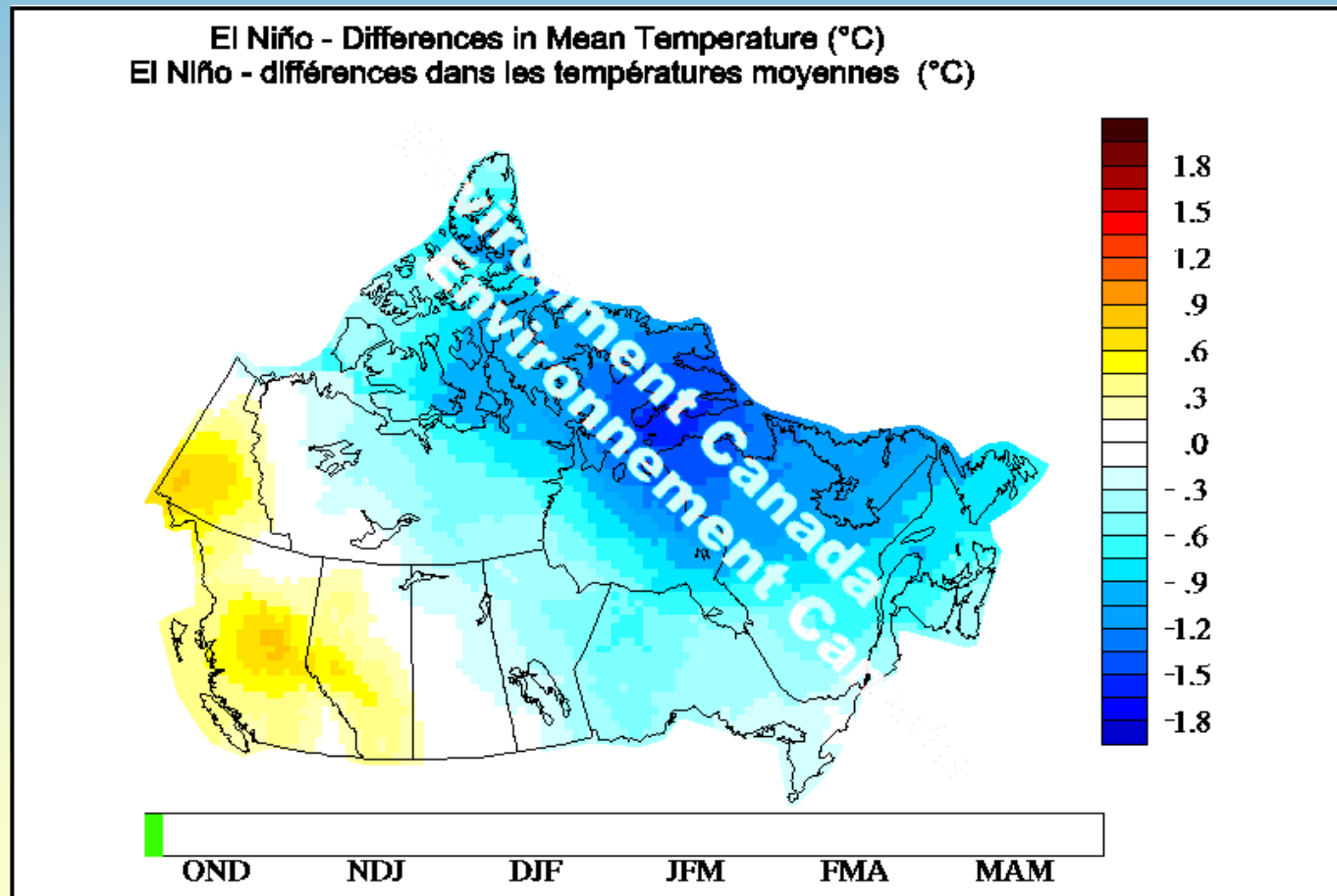
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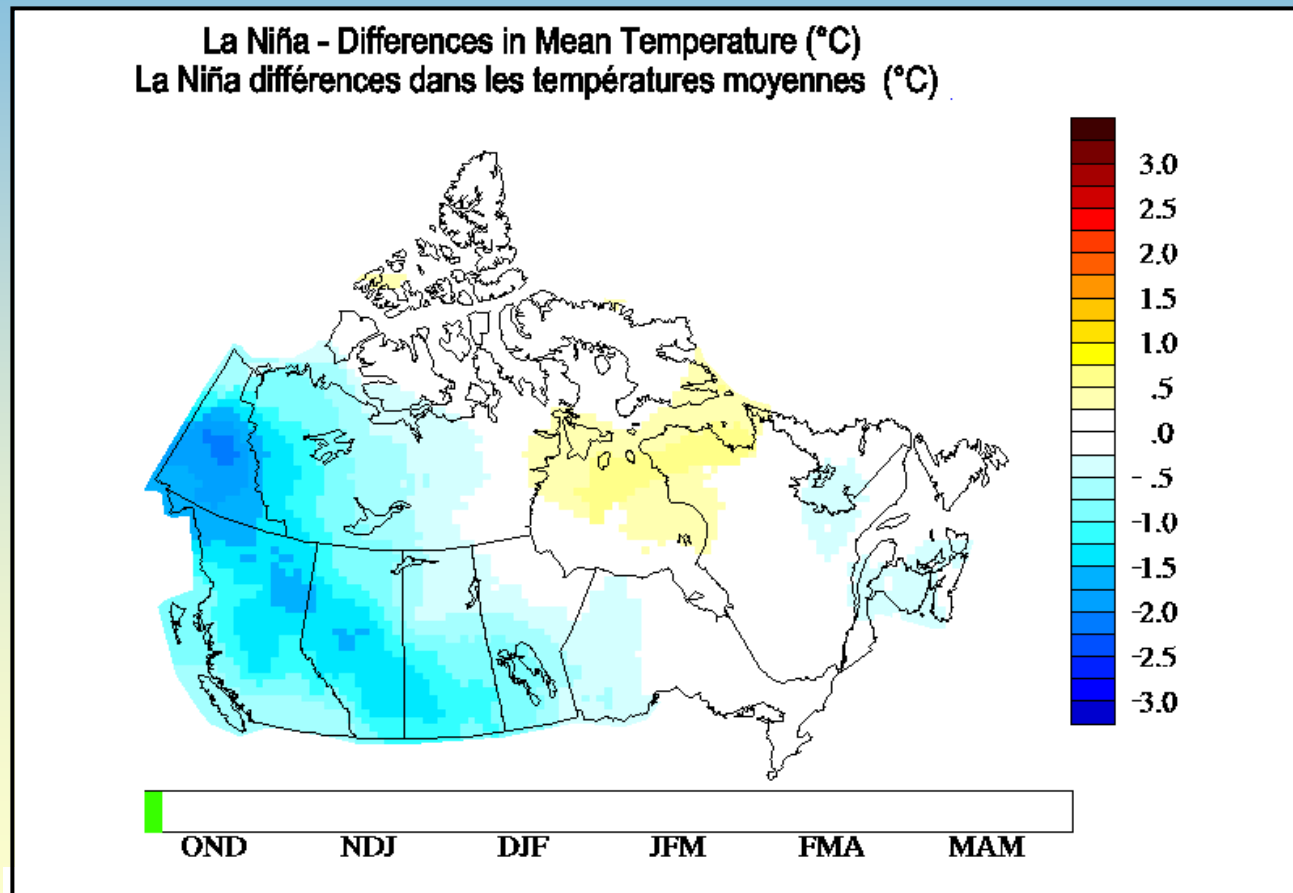
# Changes in Temperature Distribution



# Animation of Winter Temperature Changes during El Niño Winters

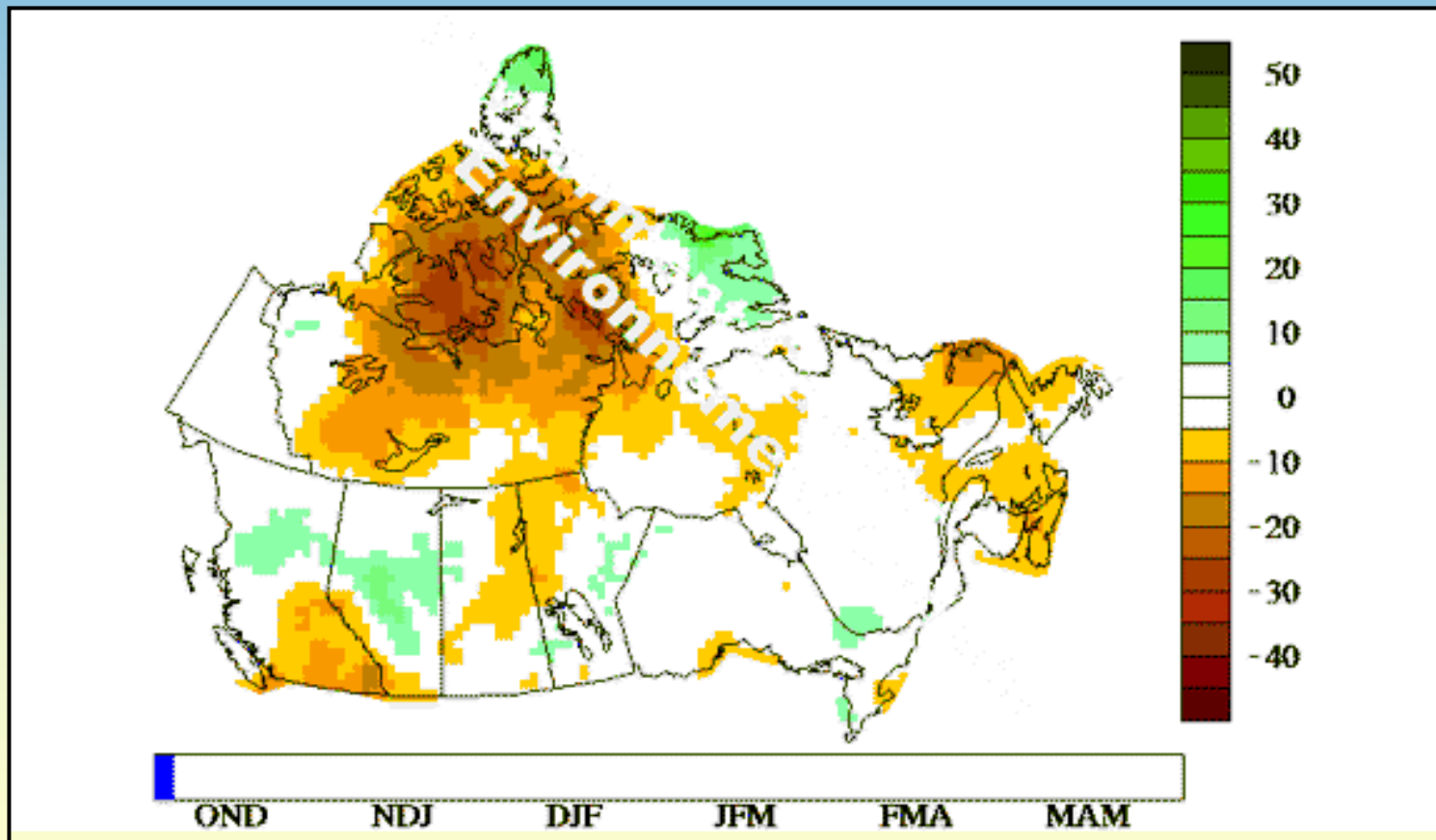


# Animation of Winter Temperature Changes during La Niña Winters





# Animation of Winter Precipitation Changes during El Niño Winters



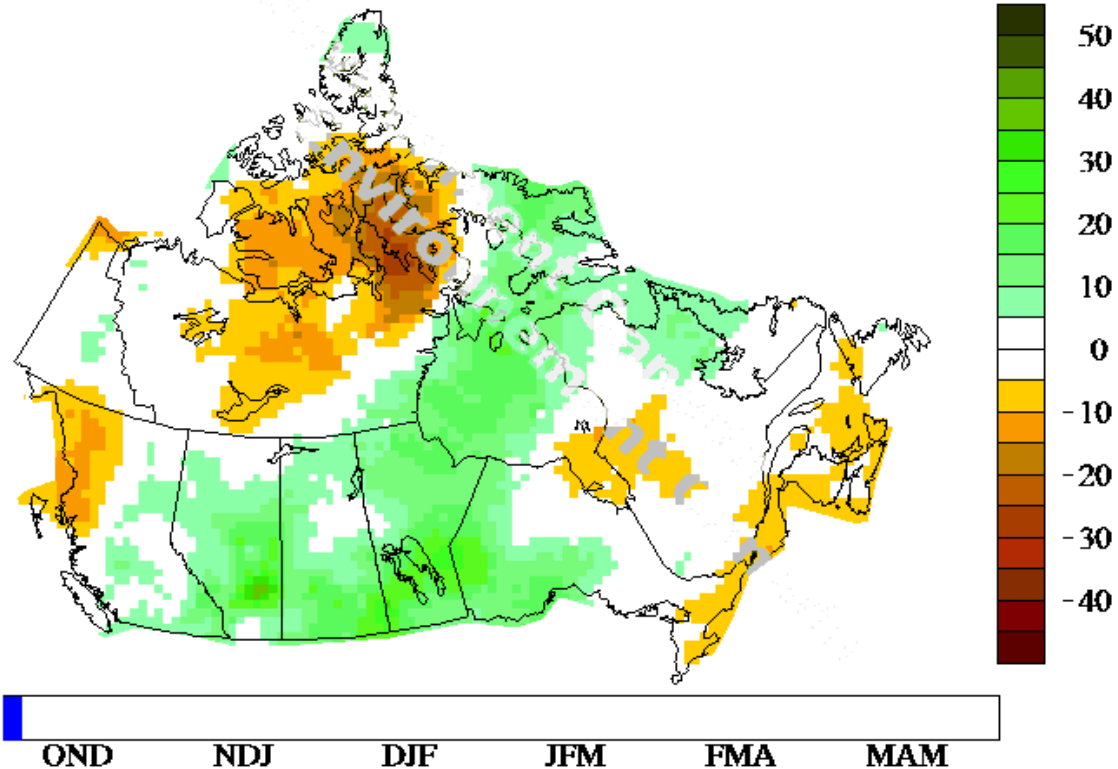
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# Animation of Winter Precipitation Changes during La Niña Winters

La Niña - Differences in Precipitation (% of normal)  
La Niña - différences dans les précipitations (% de la normale)



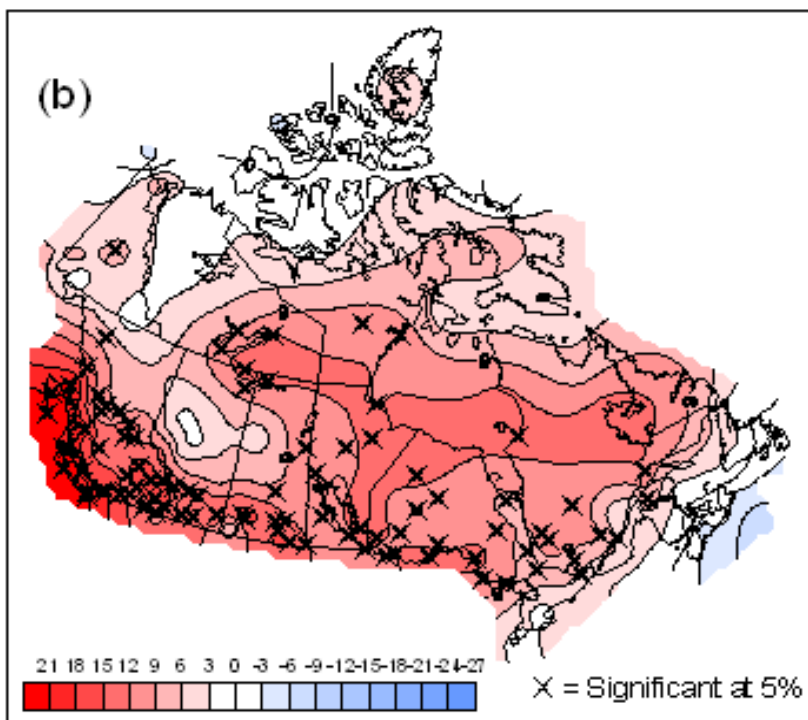
Environment Environnement  
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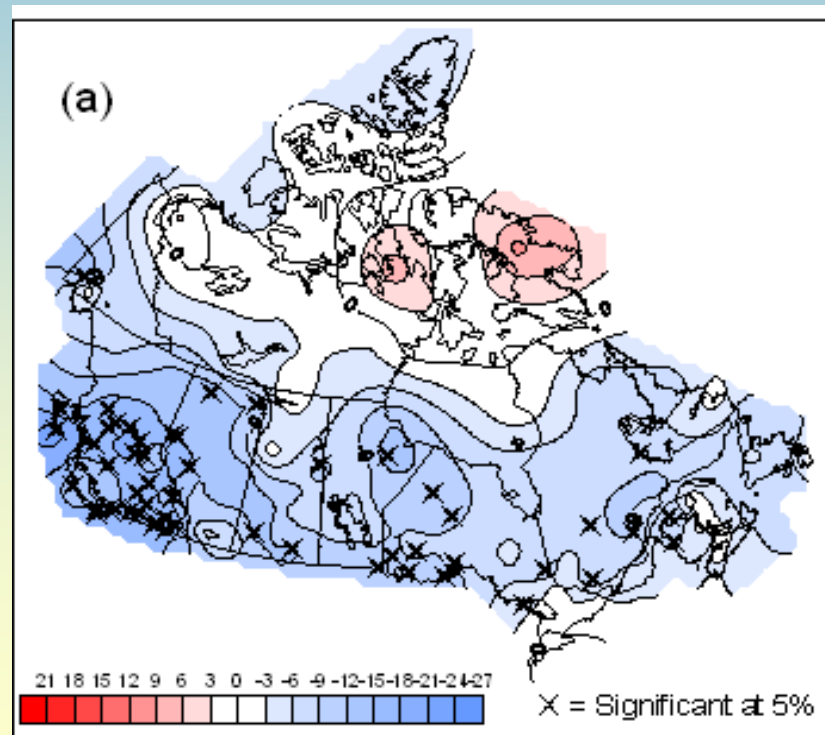
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# Temperature Extremes (Winter)

Percent of days above 90<sup>th</sup> percentile (El Nino – La Nina)

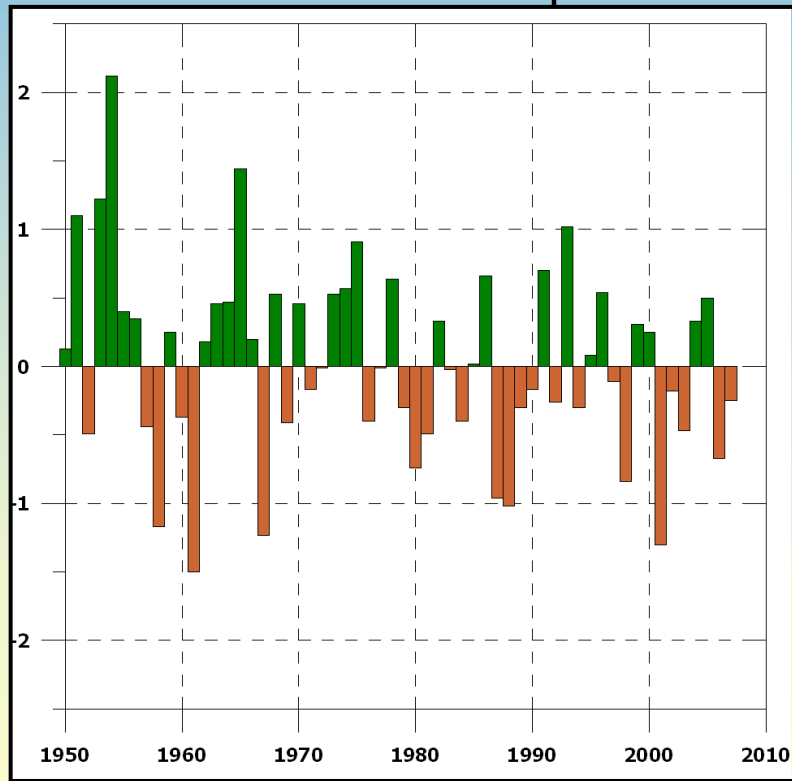


Percent of days below 10<sup>th</sup> percentile (El Nino – La Nina)



# Drought on the Prairies

Standardized Precipitation

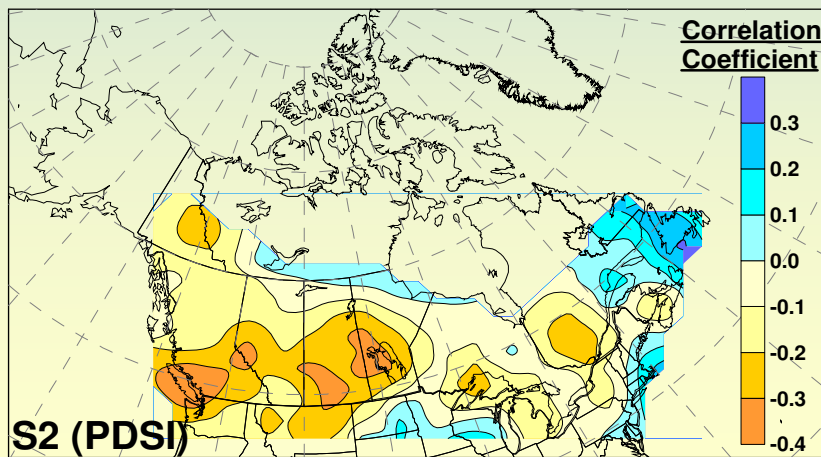
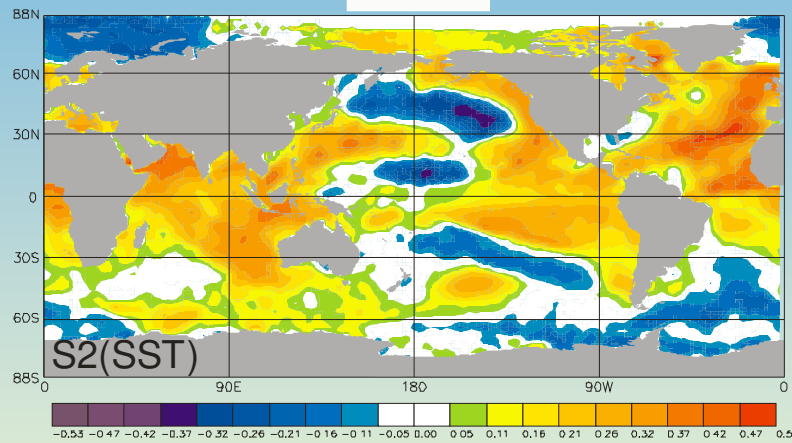


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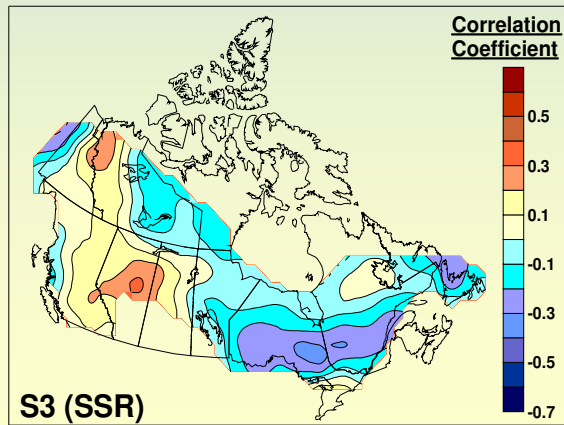
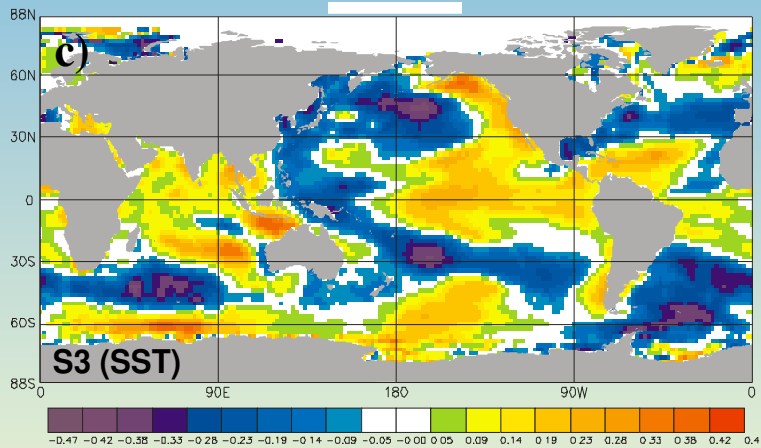
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# El Niño and Canadian Drought

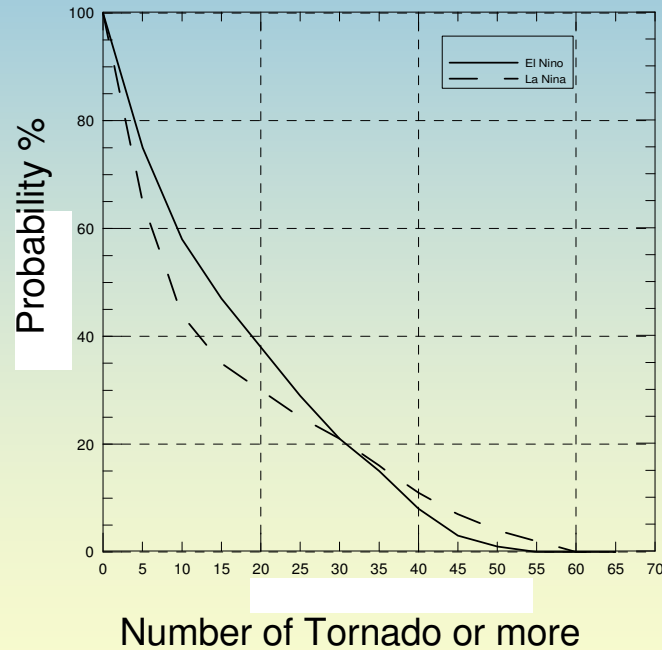


# El Niño and Forest Fire

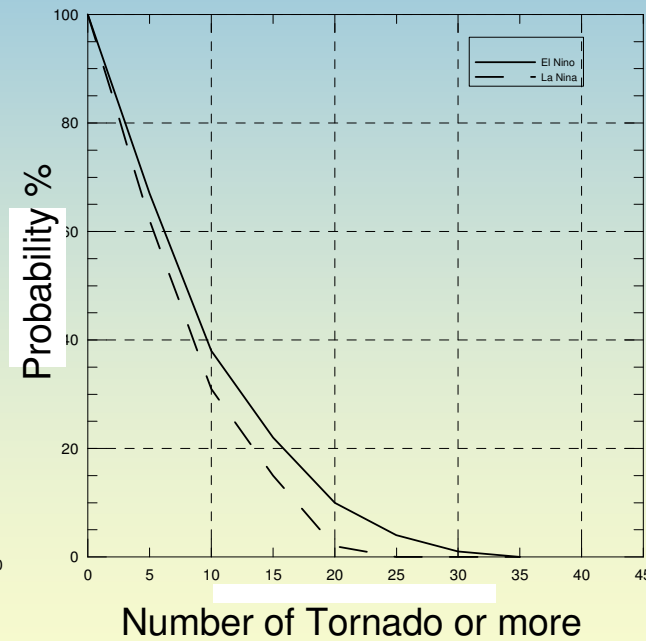


# El Niño and Tornado in Canada

Cumulative Frequency of Tornadoes  
(Western Canada)

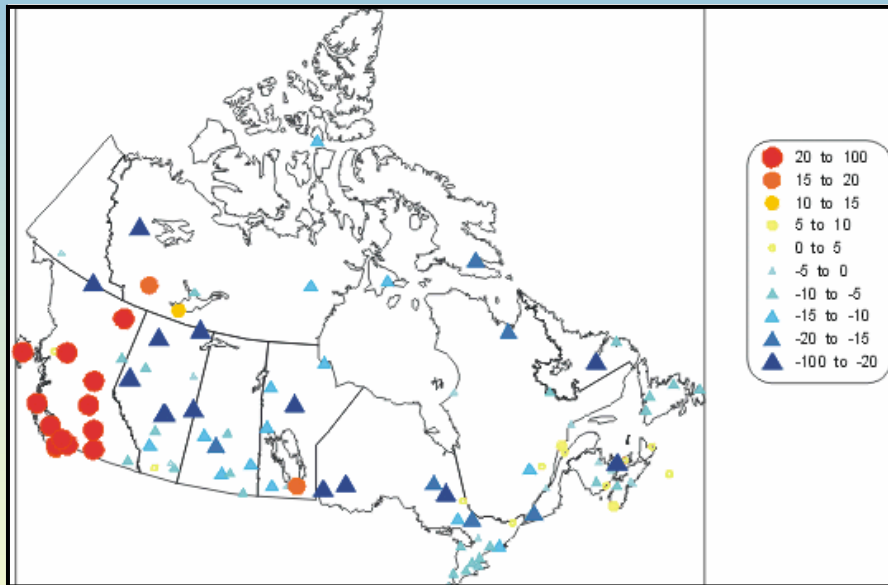


Cumulative Frequency of Tornadoes  
(Eastern Canada)

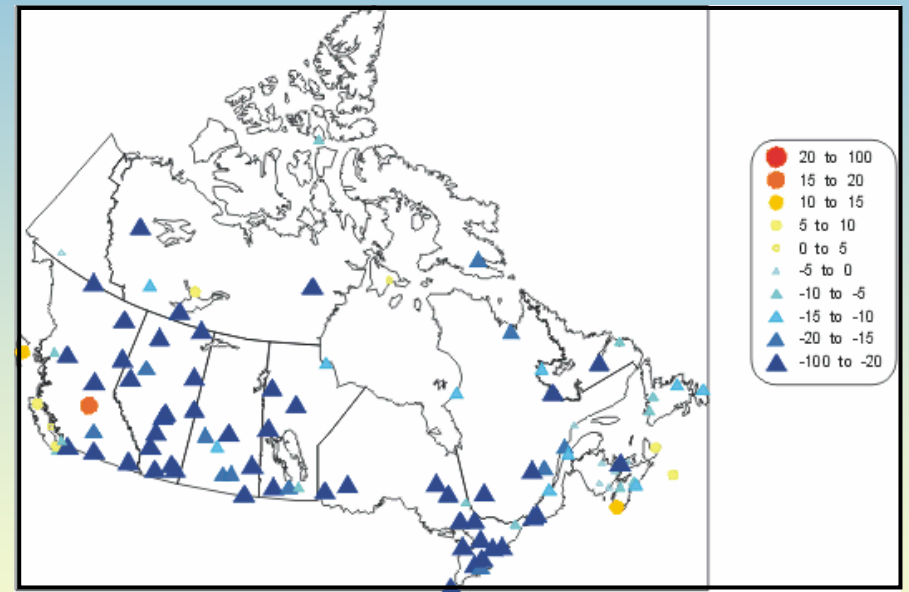


# El Niño and Wind Damage

December



January



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# March 9 2002 Ontario Wind Storm

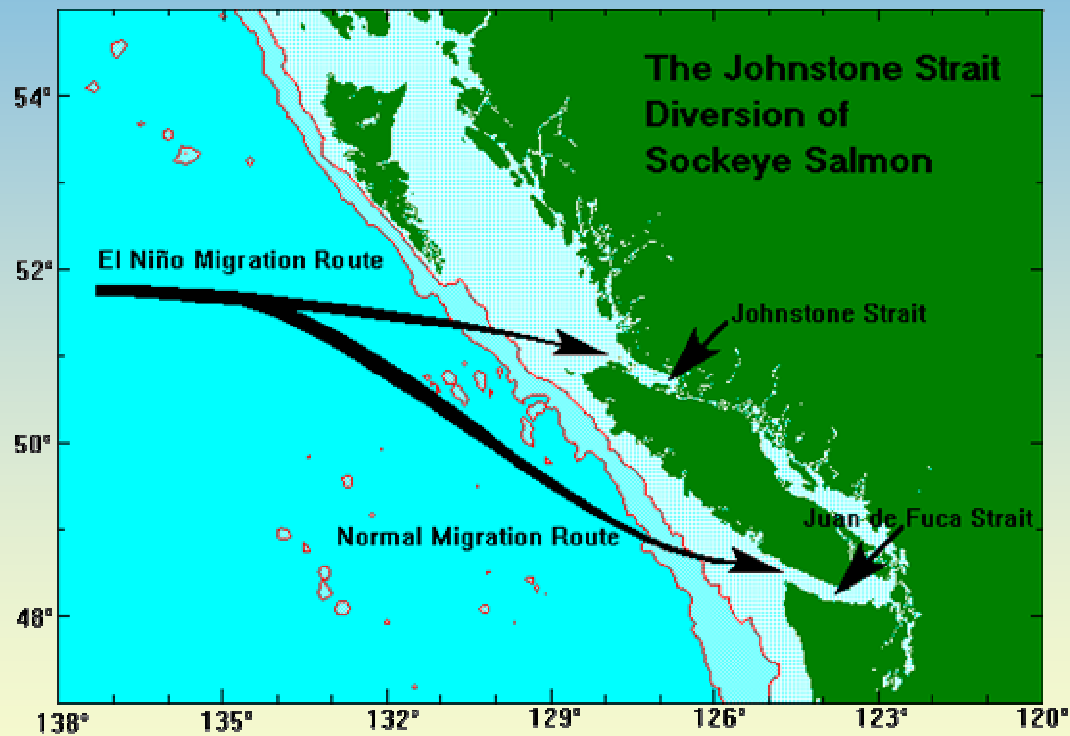
**Southern Ontario Wind**

Saturday Evening	Peak Gusts
Port Colborne	124 km/h
London	113 km/h
Toronto	111 km/h
Niagara Falls	105 km/h
Kitchener	100 km/h

11:45:52 PM      Overnight  
0°      -5°

- \$20 million in insured losses
- When adjusted for no claims, amounts rose to \$40 million

# El Niño and Fishery



Veracious mackerel venture north with warm El Nino waters and feed on juvenile salmon



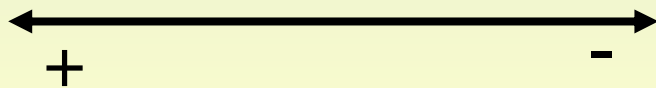
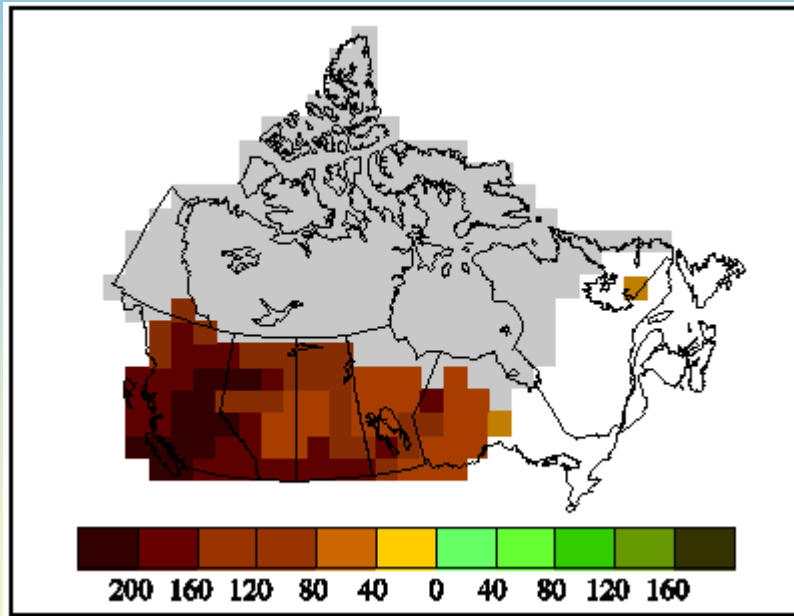
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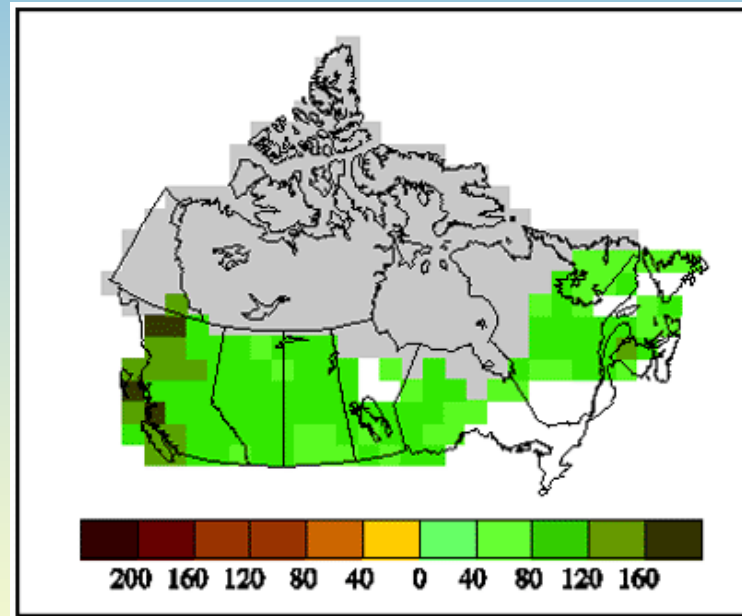
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# Likelihood of Winter Temperature Extremes (% above chance)

El Nino



La Nina



Climatological risk is about 20%



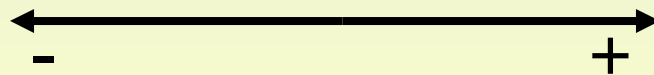
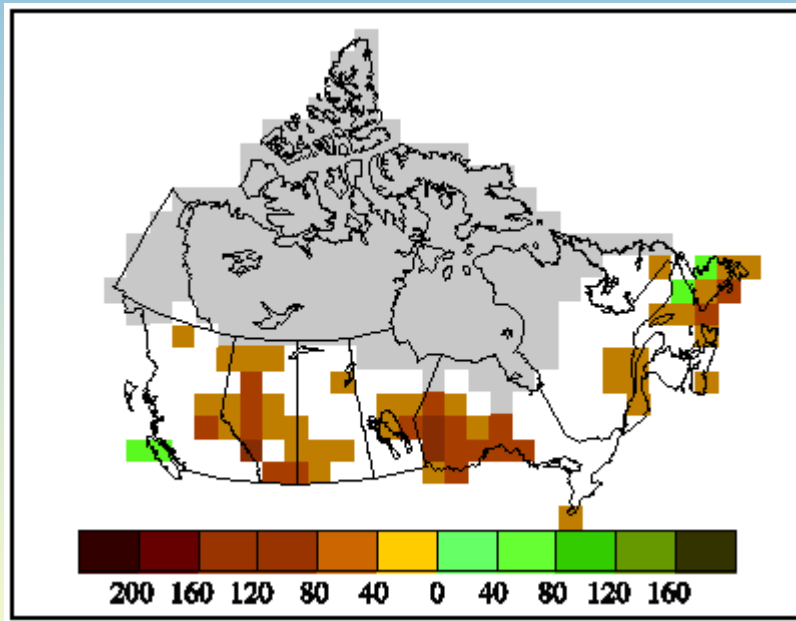
Environment Environnement  
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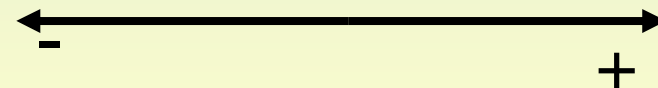
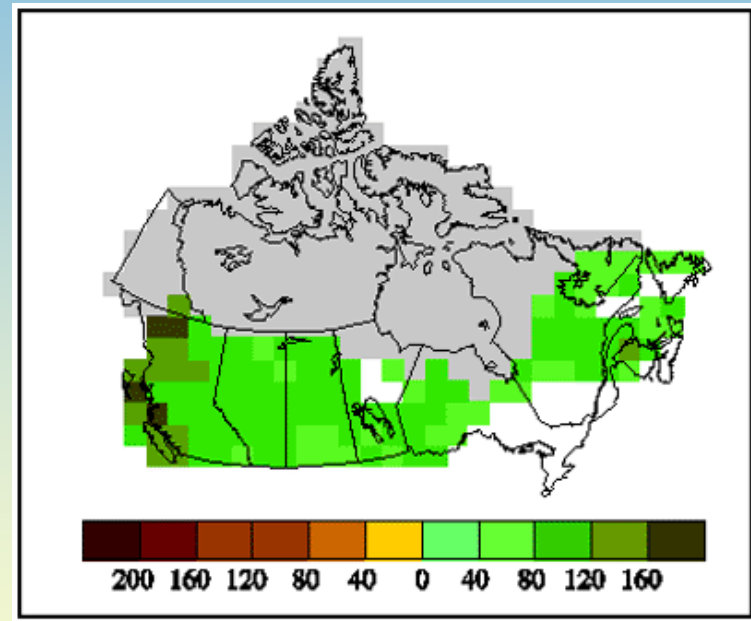
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# Likelihood of Winter Precipitation Extremes (% above chance)

El Nino



La Nina





# 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
- ❑ 1997-98 El Niño contributed to the Great ice storm of January 1998 in eastern Canada. About 28 deaths and estimated cost of over 5 billion dollars.





# Canadian El Niño/La Niña Impact

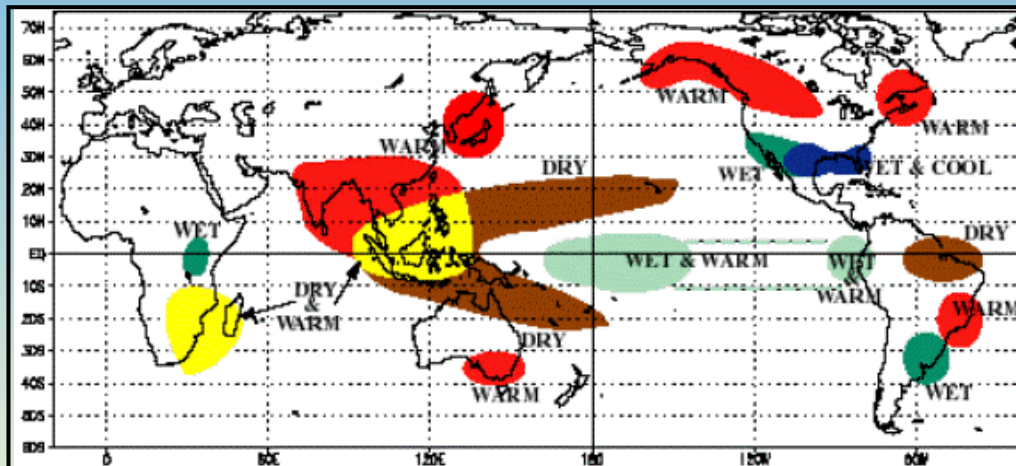
- ❑ The Saguenay floods of 1996 followed on the heels of La Niña and were the most devastating in Canadian history, resulting in 10 deaths, \$800 million in damages, 1,718 houses and 900 cottages destroyed or damaged.
- ❑ The two-day rainfall was equivalent to the volume of water that tumbles over Niagara Falls in four weeks.



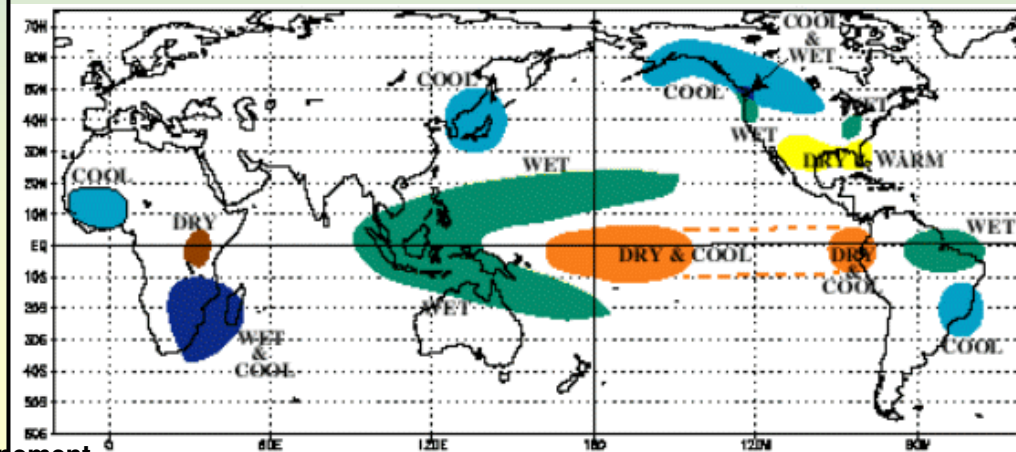


# Global Impact of El Niño/La Niña

El Nino



La Nina





# Global Economic Impact

- El Niño contributed to record global warmth in 1998. El Niño contributes to global temperature by about 0.02 Celsius degree
- Australia suffered worst drought in a century during 2002 El Niño. Damage estimated at \$5 billion
- 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



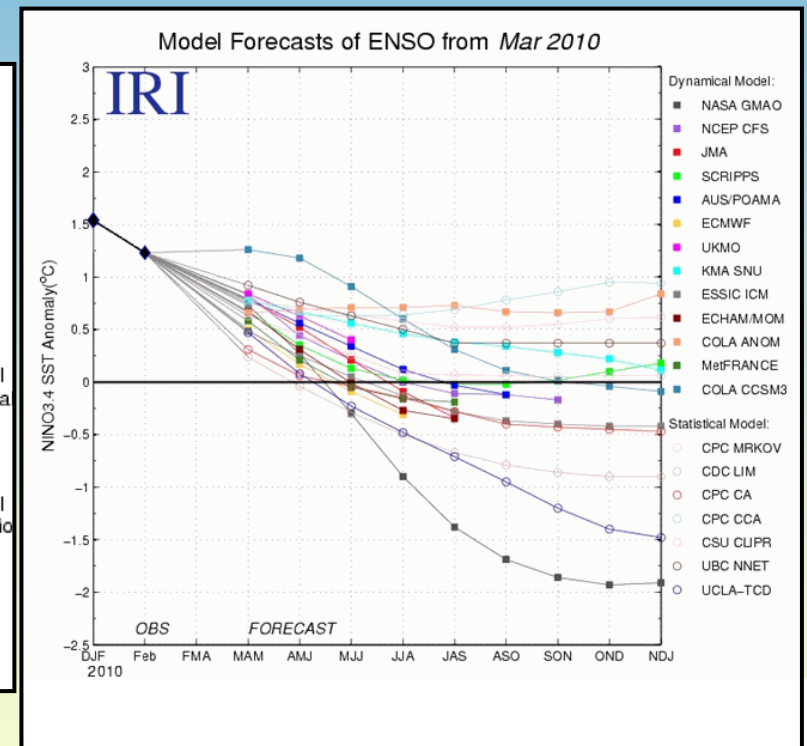
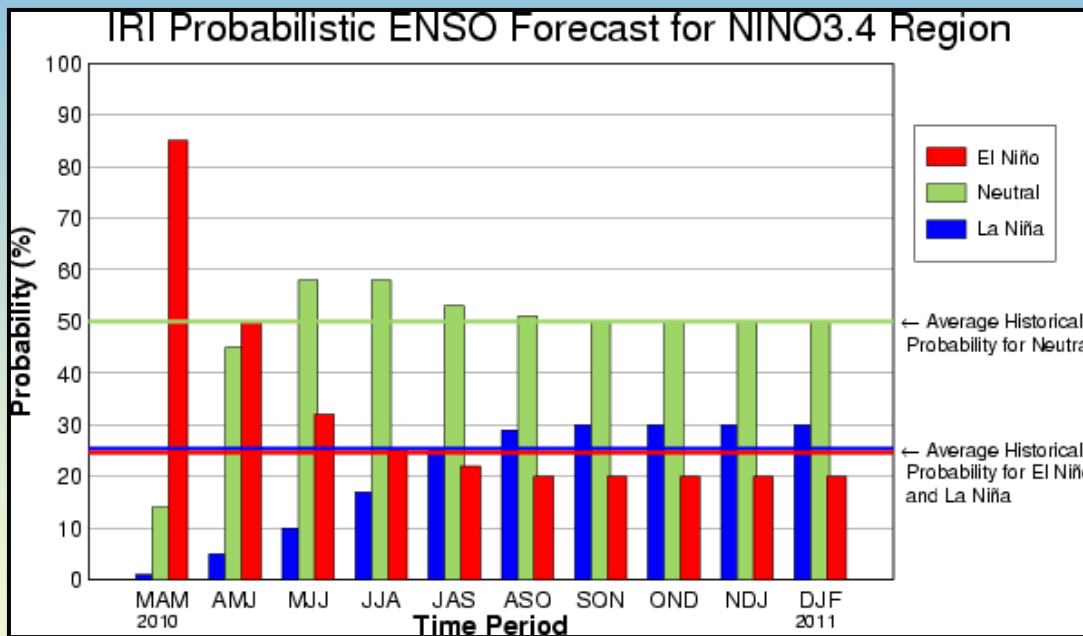


# Global Economic Impact

- ❑ 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 Niño will transition to neutral conditions by summer 2010

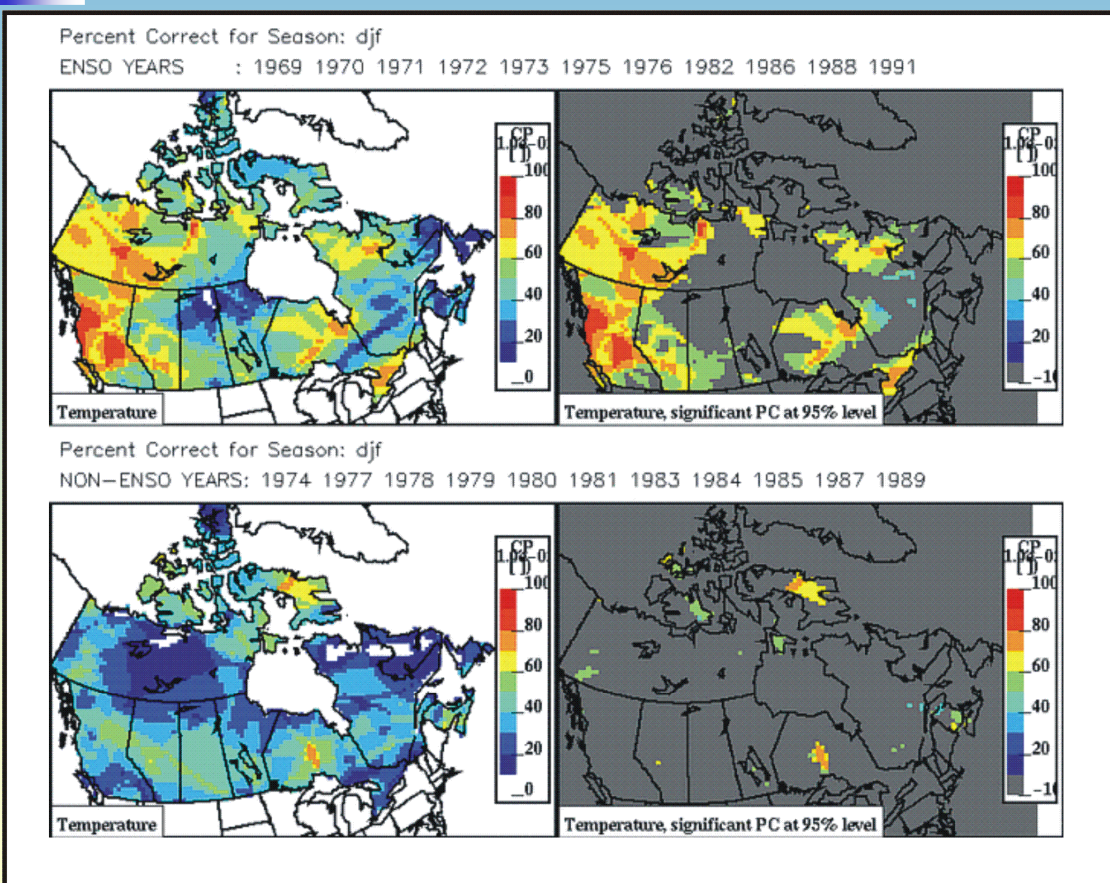


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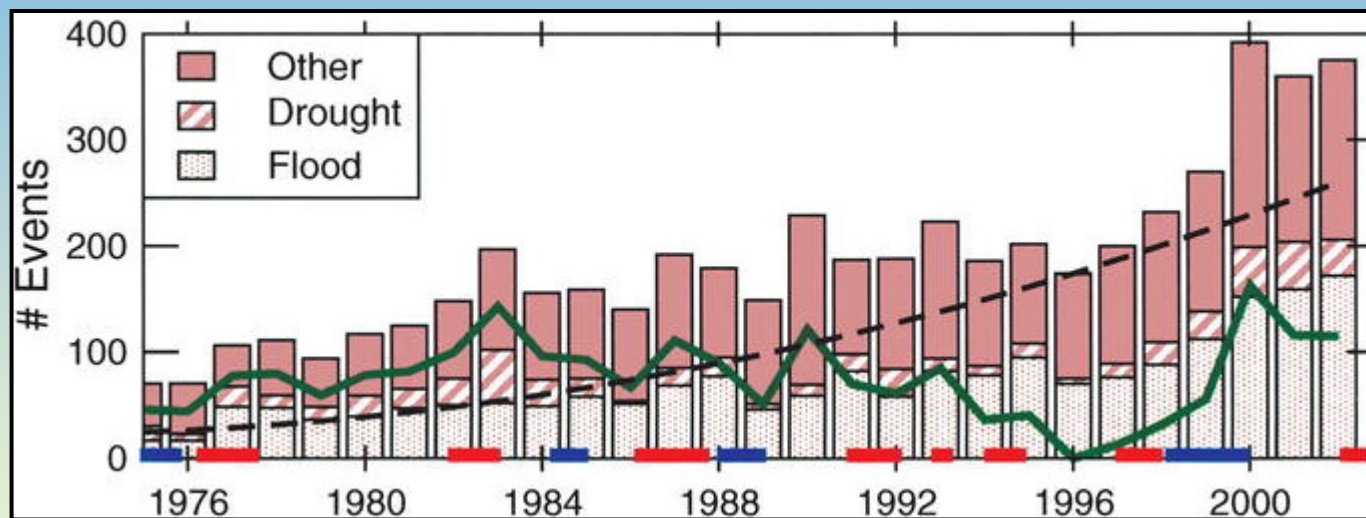
# Canadian Forecast during El Niño



Skilful forecast  
during EL Nino  
and La Nina  
winters in Canada



# Hydrometeorological World Disaster



- ❑ 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

<http://www.ec.gc.ca/adsc-cmda/default.asp?lang=En&n=208ED67A-1>

- La Niña

<http://www.ec.gc.ca/adsc-cmda/default.asp?lang=En&n=98231106-0>

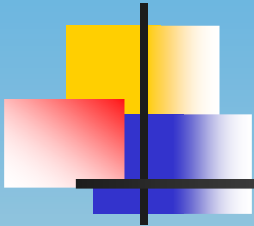


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*Thank You*

