New climate change scenarios for the Pacific Northwest

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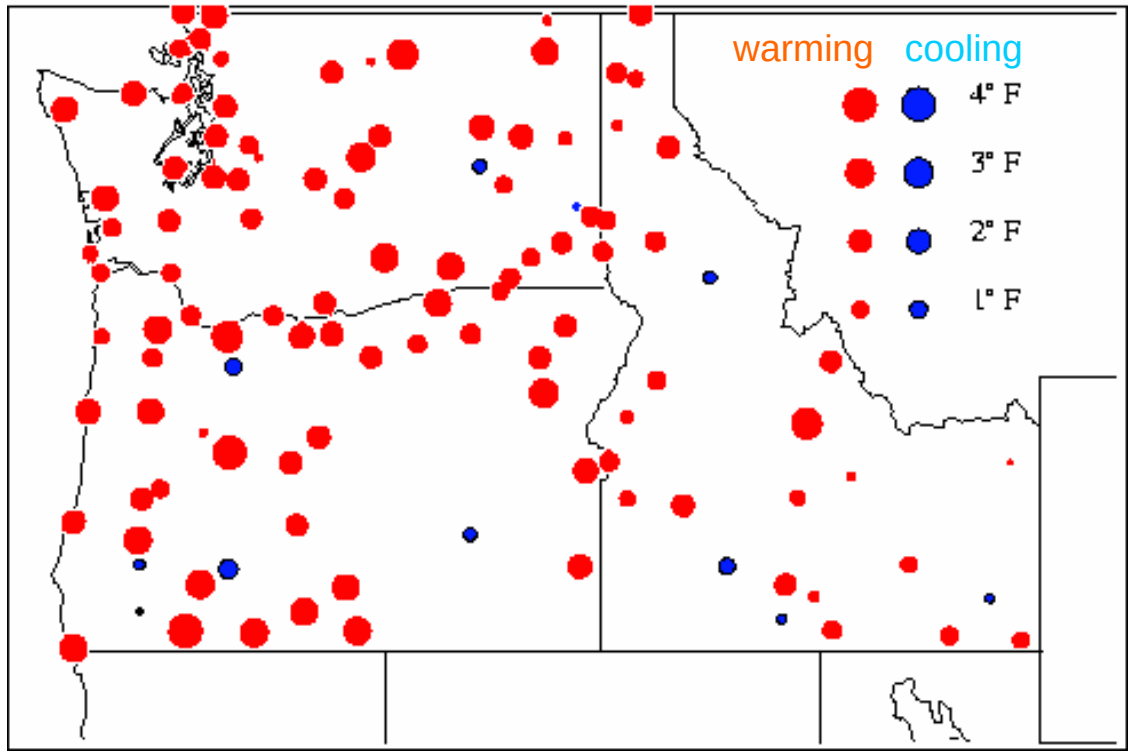
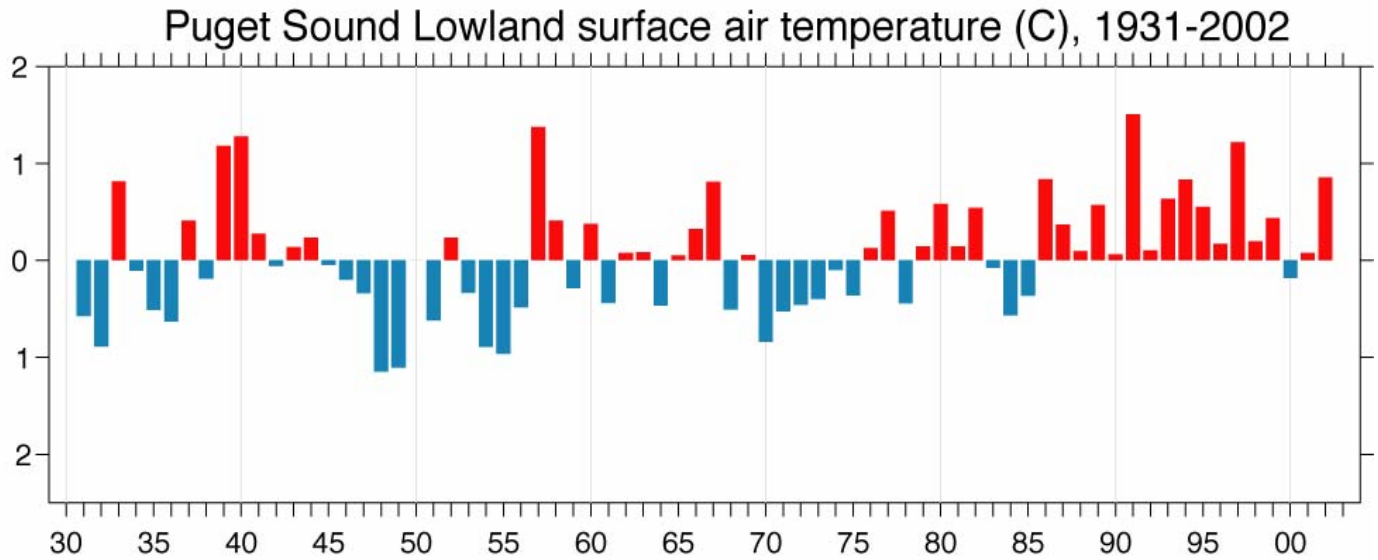
Is Our Climate Changing?
20th Century Pacific Northwest

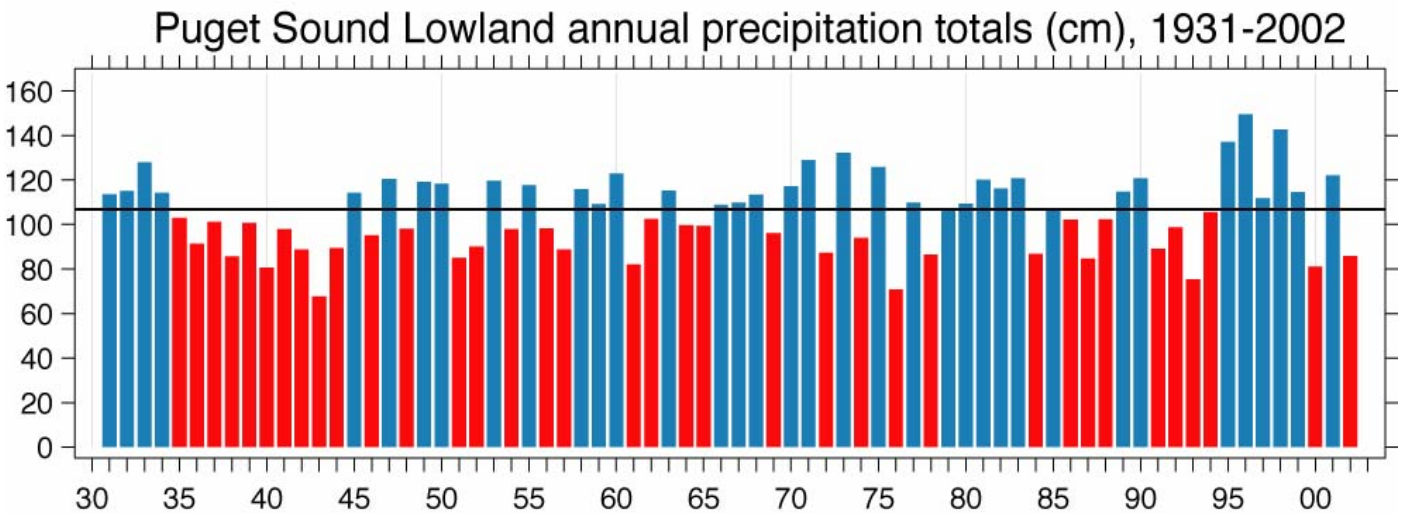
- 113 stations with long records
- Almost every station shows warming
- Urbanization not a major source of warming

100-year Temperature Trends

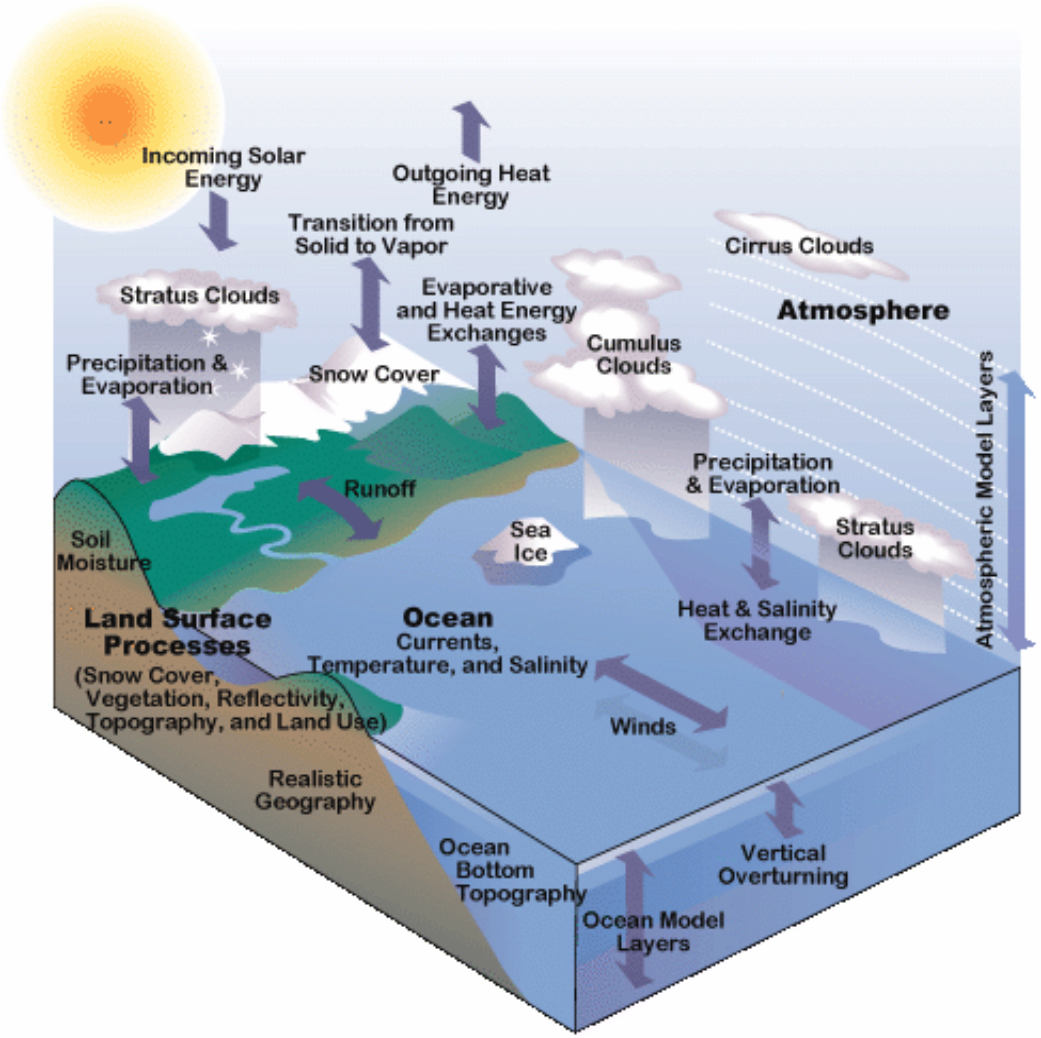


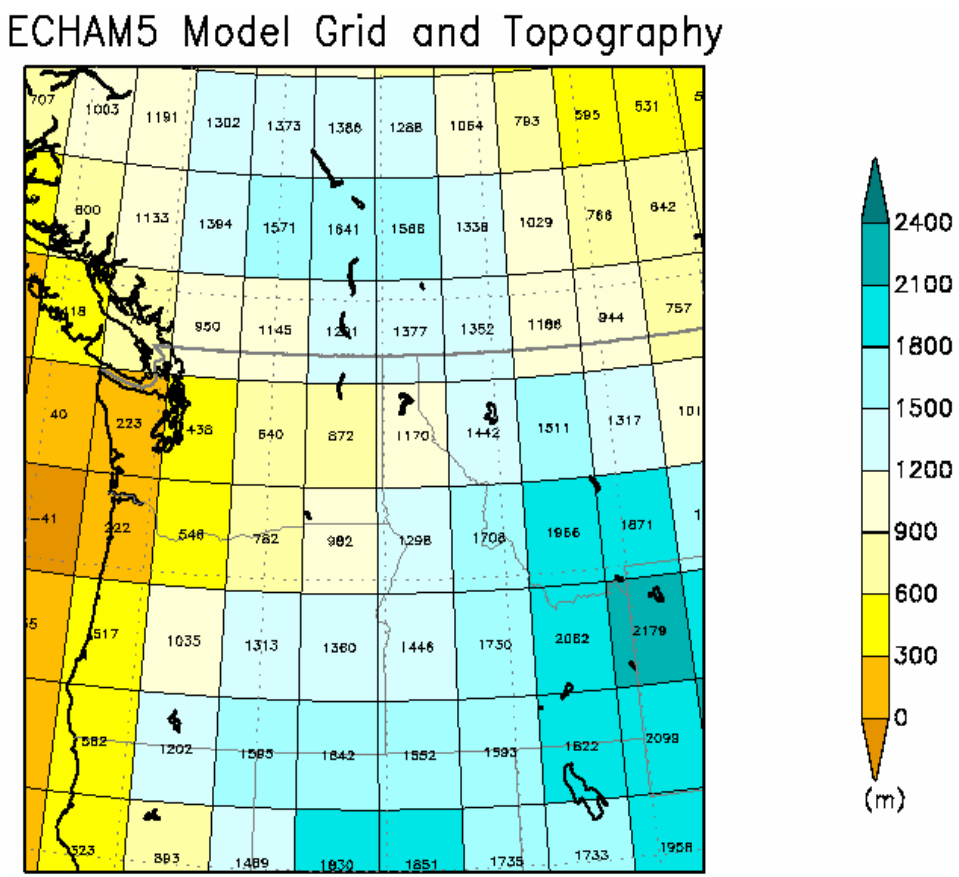
Some year-by-year data



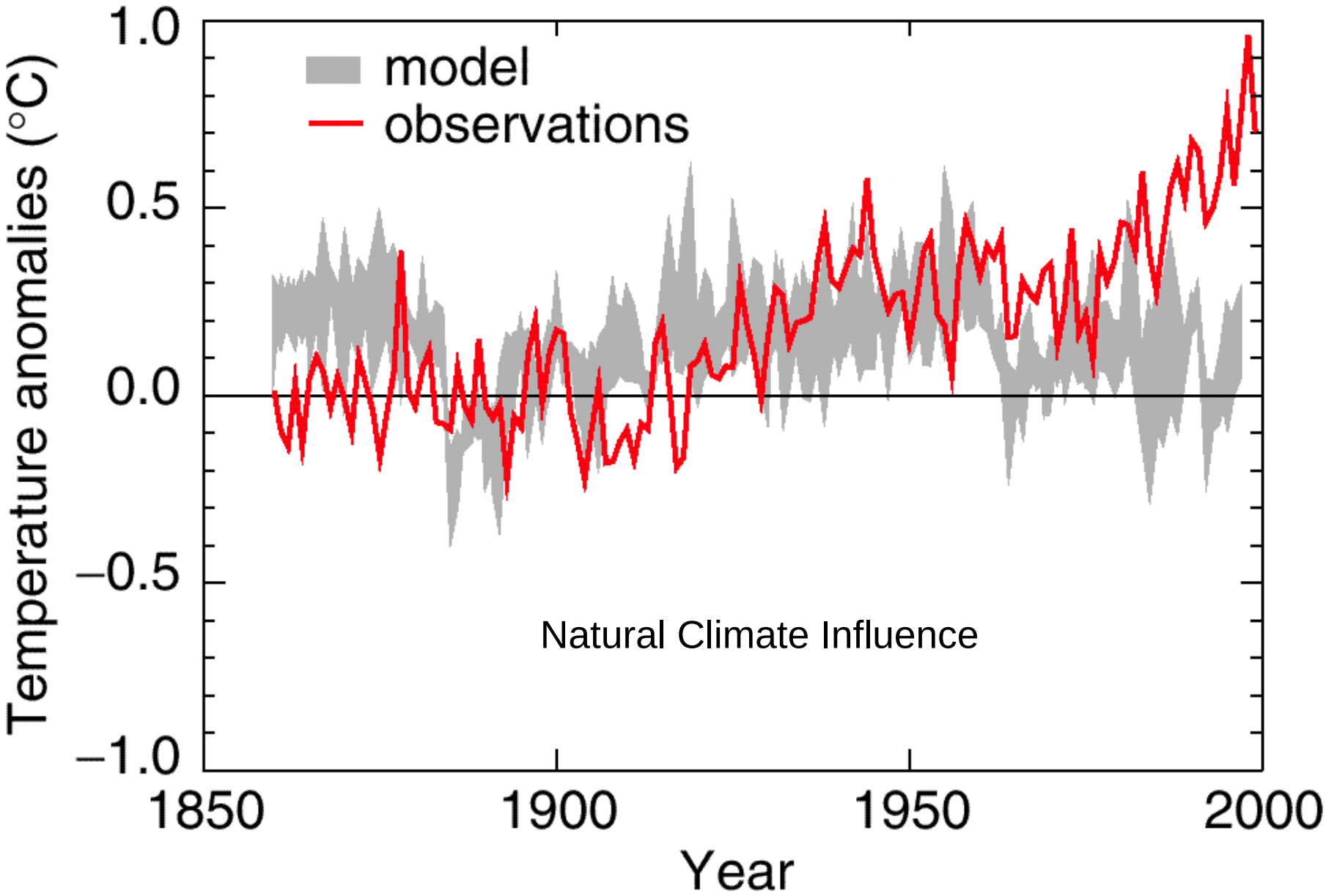


Global Climate System Model



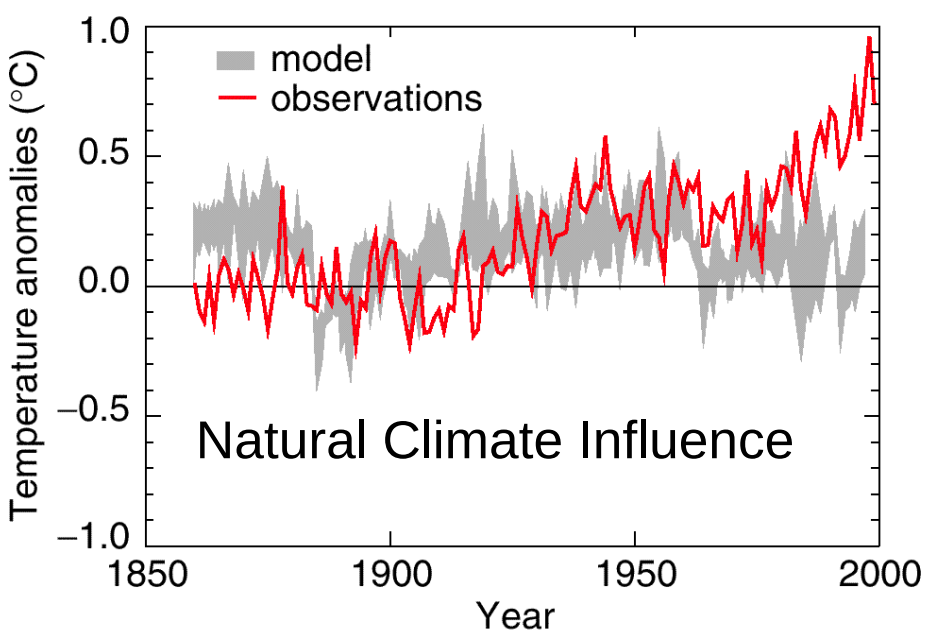


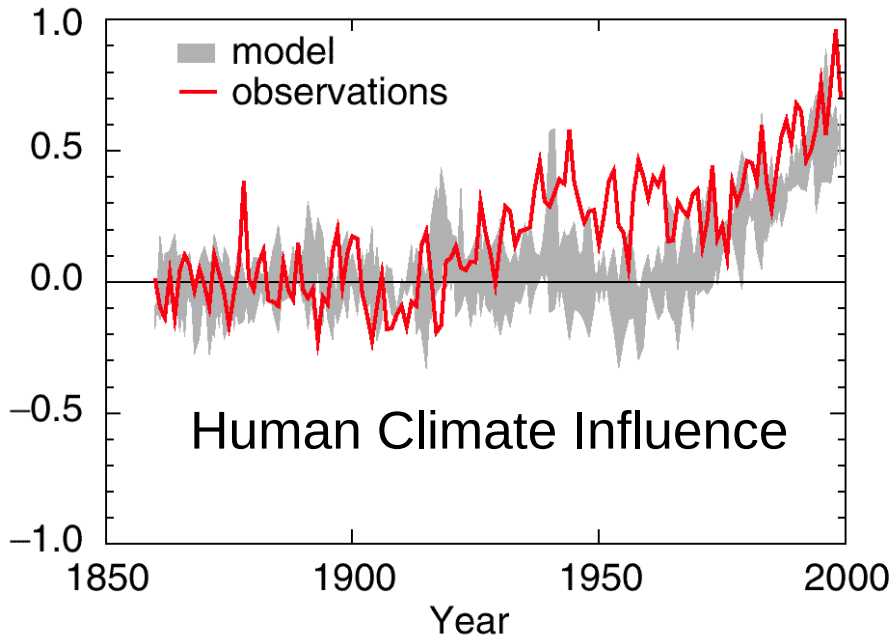
Natural and Anthropogenic Causes

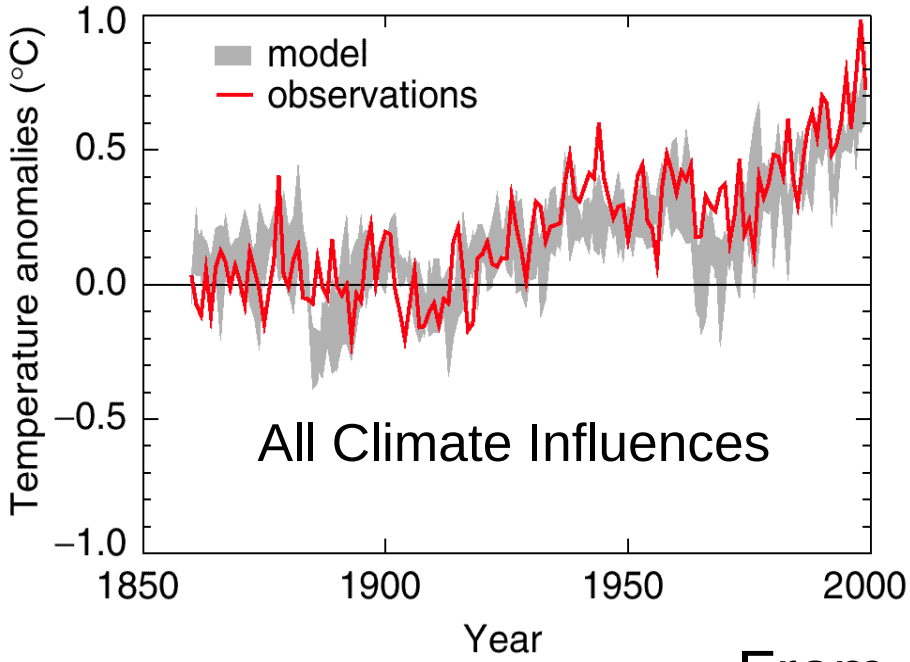


From IPCC Working Group I

Natural and Anthropogenic Causes





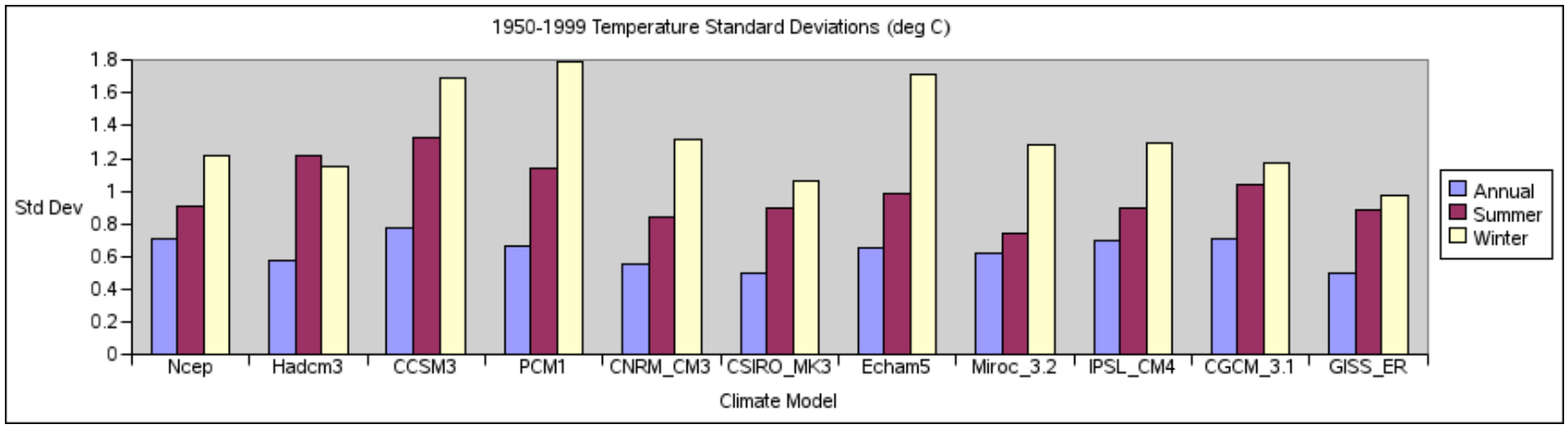


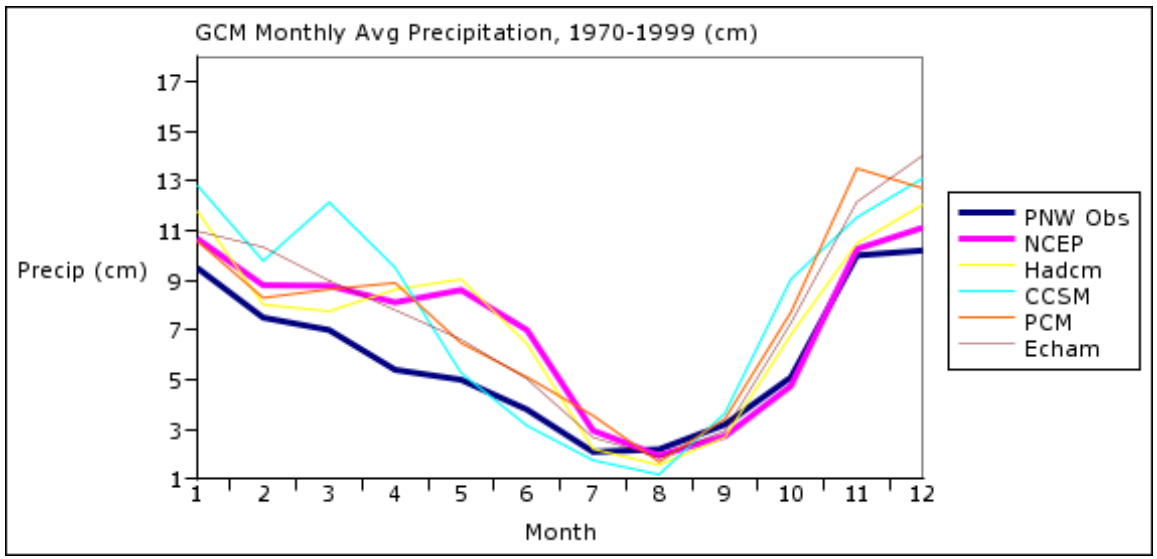
From IPCC Working Group I

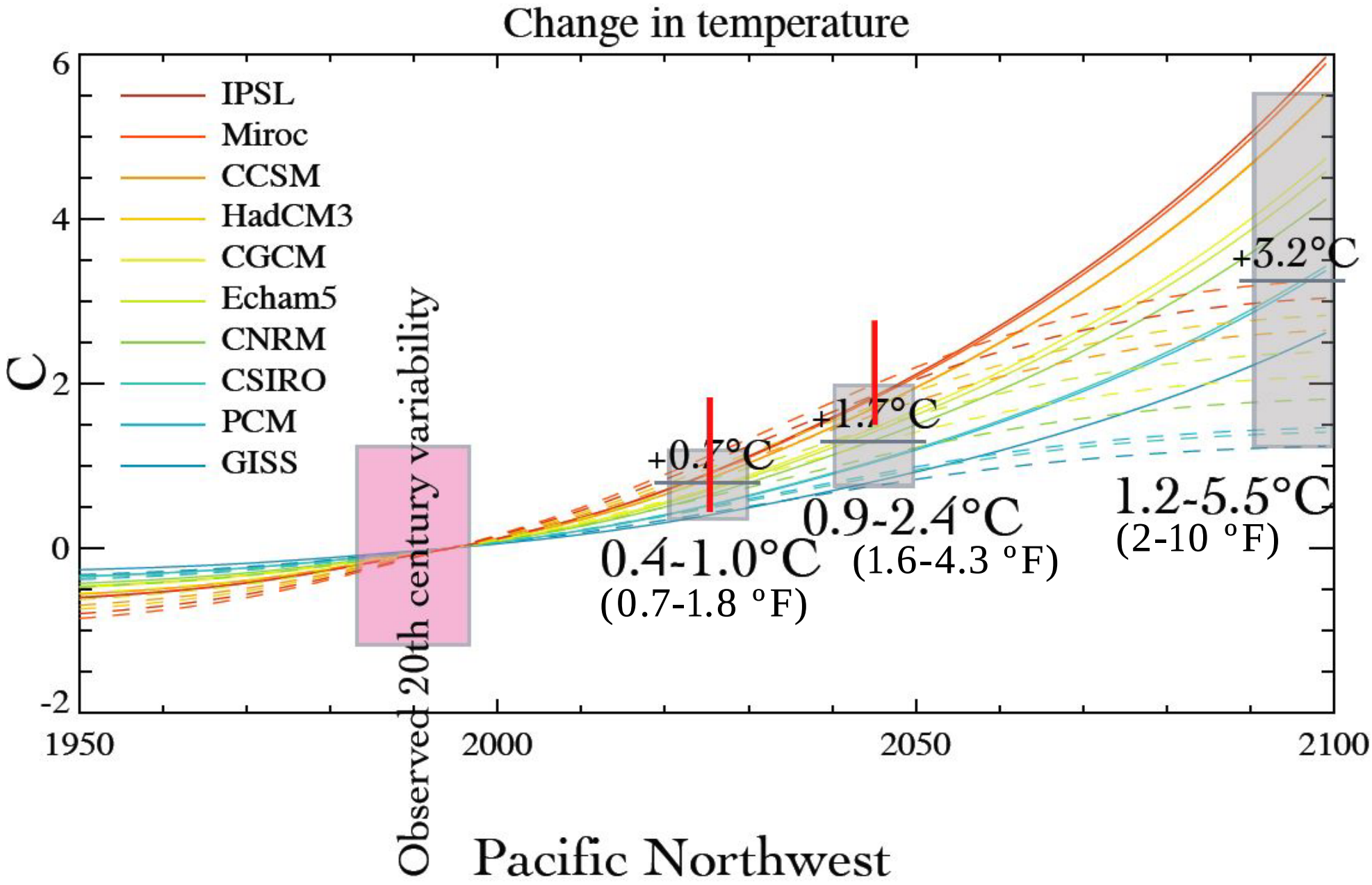
Climate Change Consensus

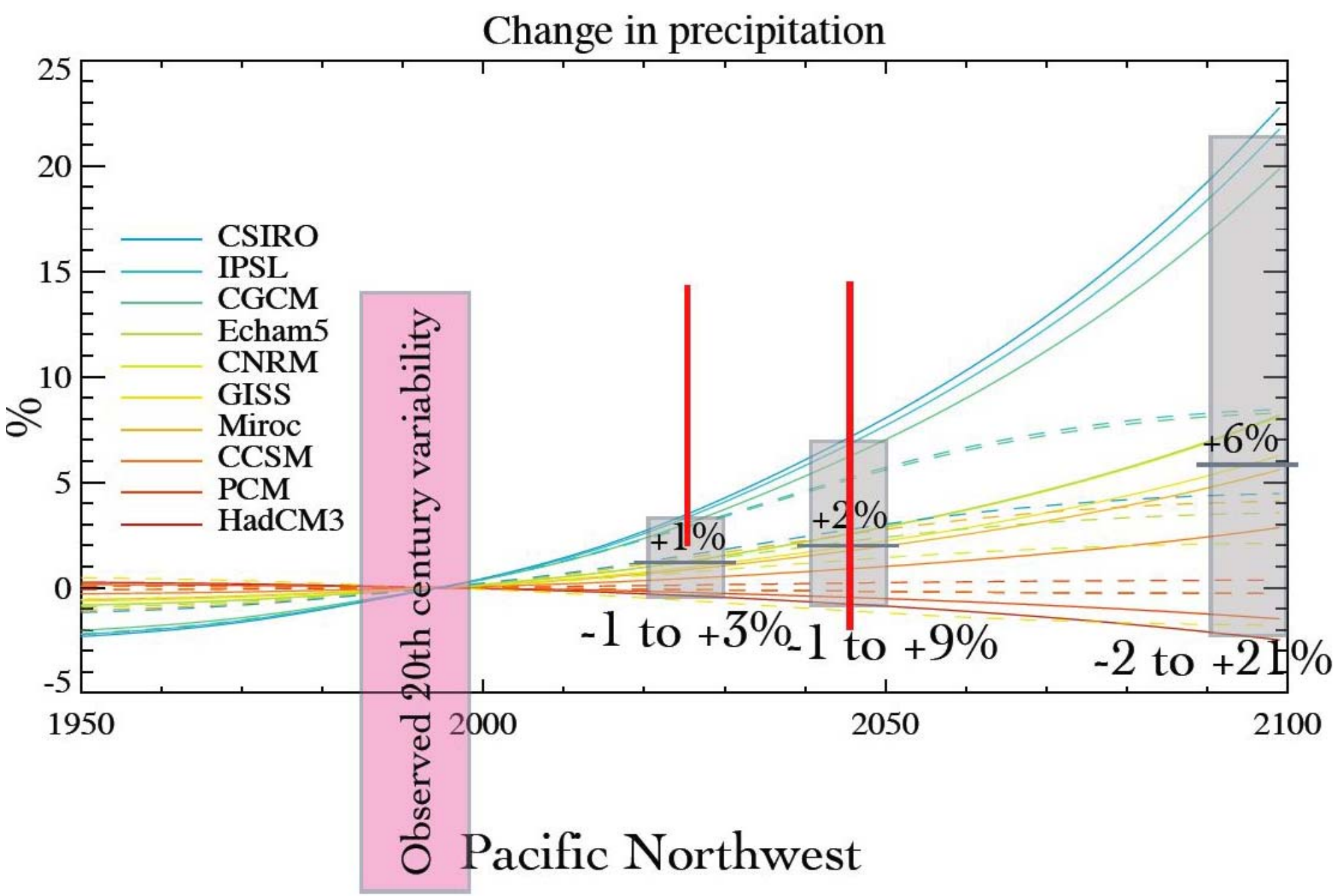
- Climate is changing, and humans are partly responsible.
- Average surface temperature will probably increase by **3 to 11°F** (1.5-6.0°C) by the year 2100.
- Other climate changes are likely to accompany this warming (precipitation, storm tracks).
- These changes will have both positive and negative consequences.

IPCC AR4 Climate Model Simulations
20th Century Evaluation

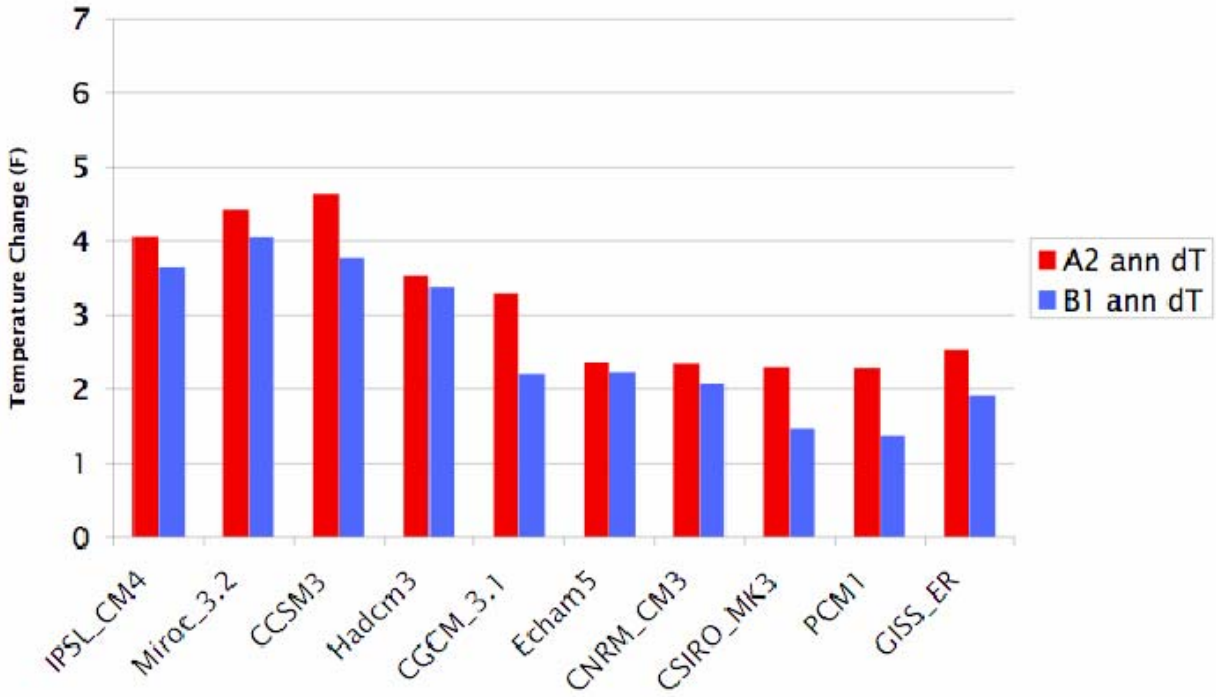




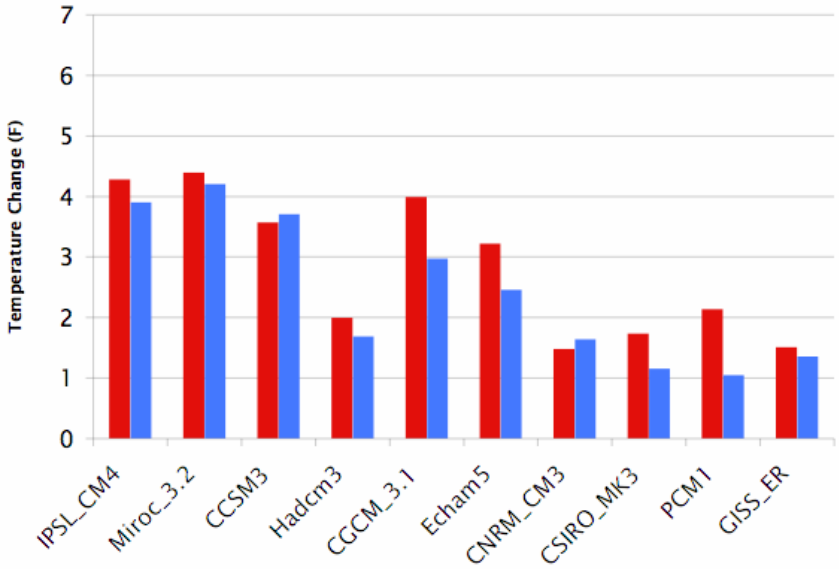

Change in temperature
6
4
2
0
-2
C
IPSL
Miroc
CCSM
HadCM3
CGCM
Echam5
CNRM
CSIRO
PCM
GISS
1950
2000
2050
2100
Observed 20th century variability
+0.7°C
+1.7°C
+3.2°C
0.4-1.0°C
(0.7-1.8 °F)
0.9-2.4°C
(1.6-4.3 °F)
1.2-5.5°C
(2-10 °F)
Pacific Northwest


Change in precipitation
25
20
15
10
5
0
-5
%
1950
2000
2050
2100
CSIRO
IPSL
CGCM
Echam5
CNRM
GISS
Miroc
CCSM
PCM
HadCM3
Observed 20th century variability
+1%
+2%
+6%
-1 to +3%
-1 to +9%
-2 to +21%
Pacific Northwest

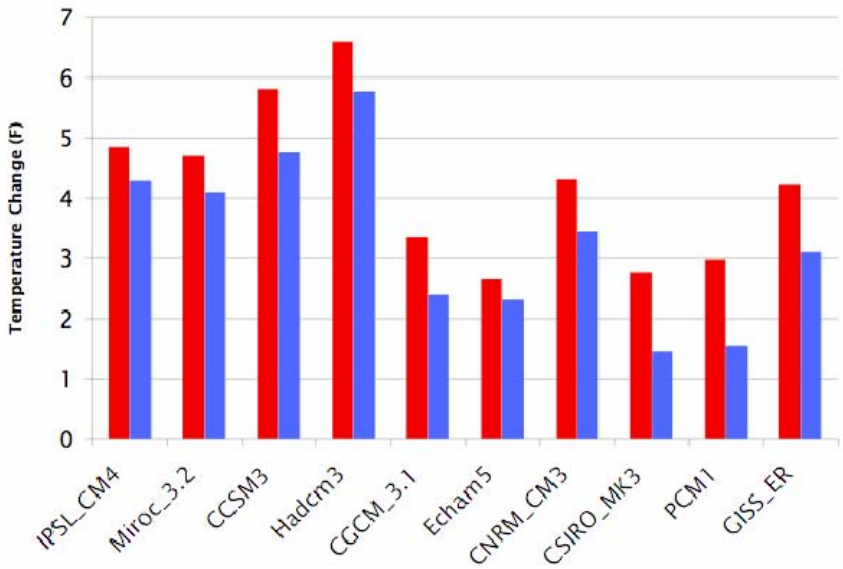
2040s Annual Temperature Change



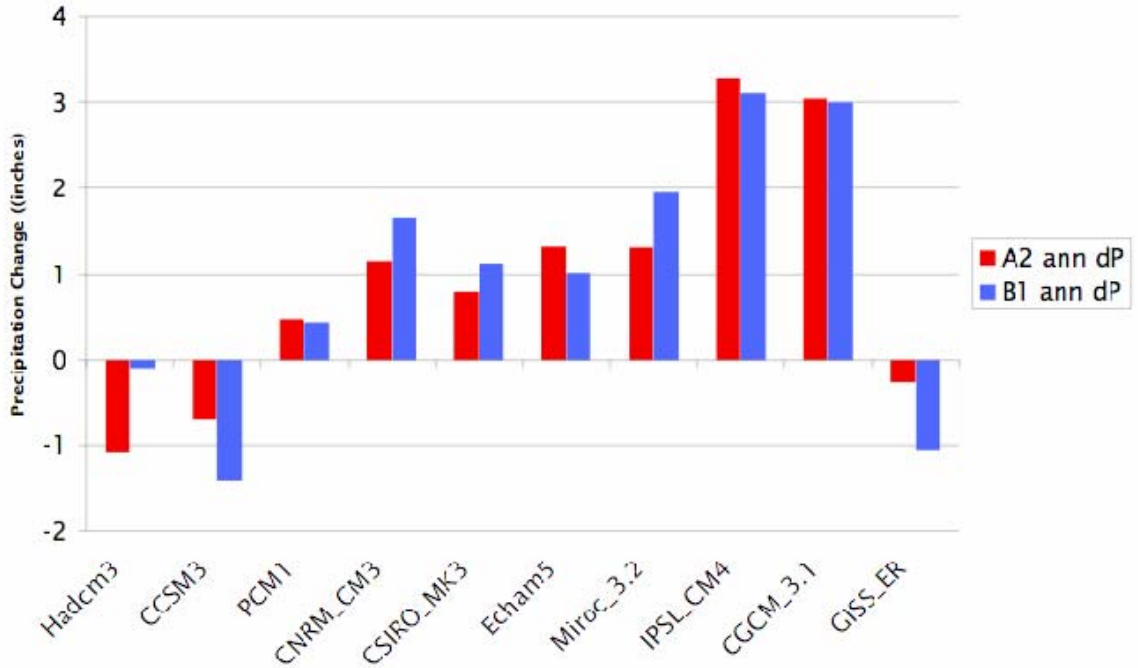
2040s Winter Temperature Change



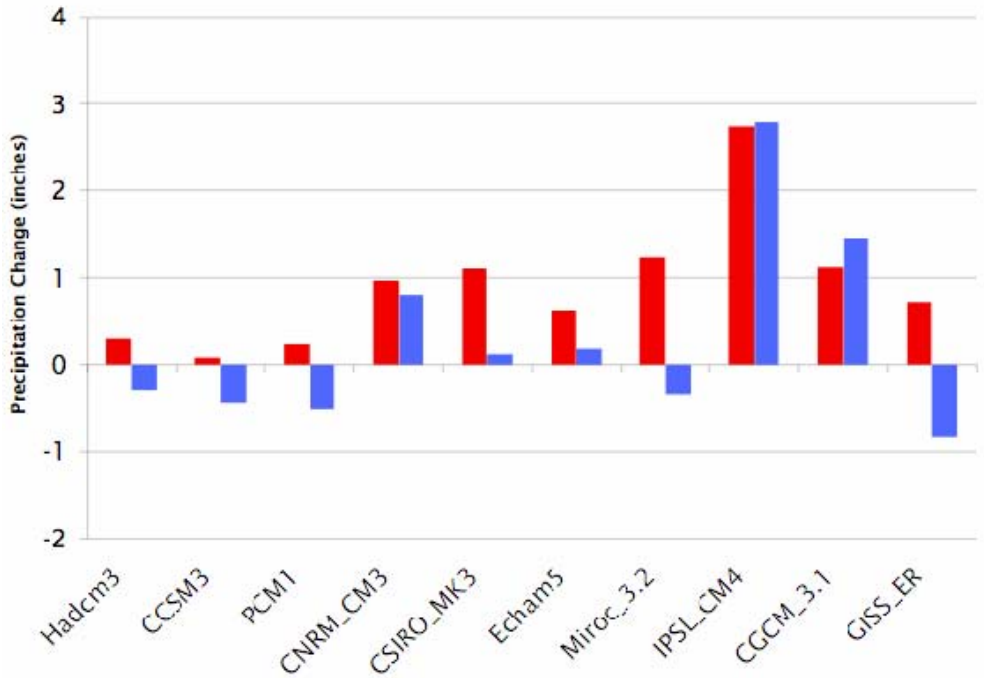
2040s Summer Temperature Change



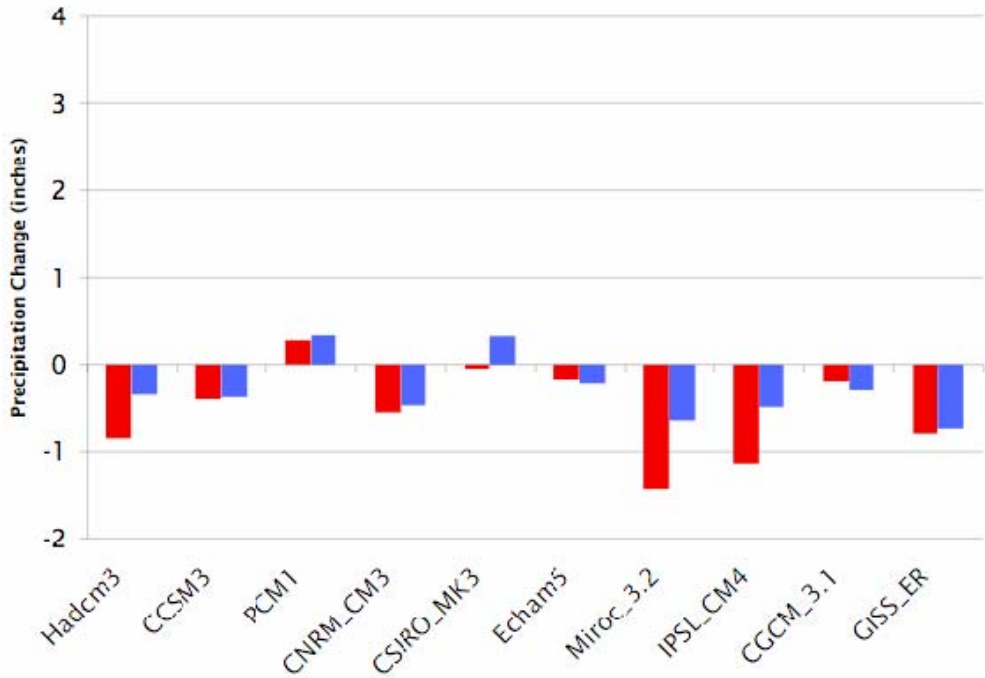
2040s Annual Precipitation Change



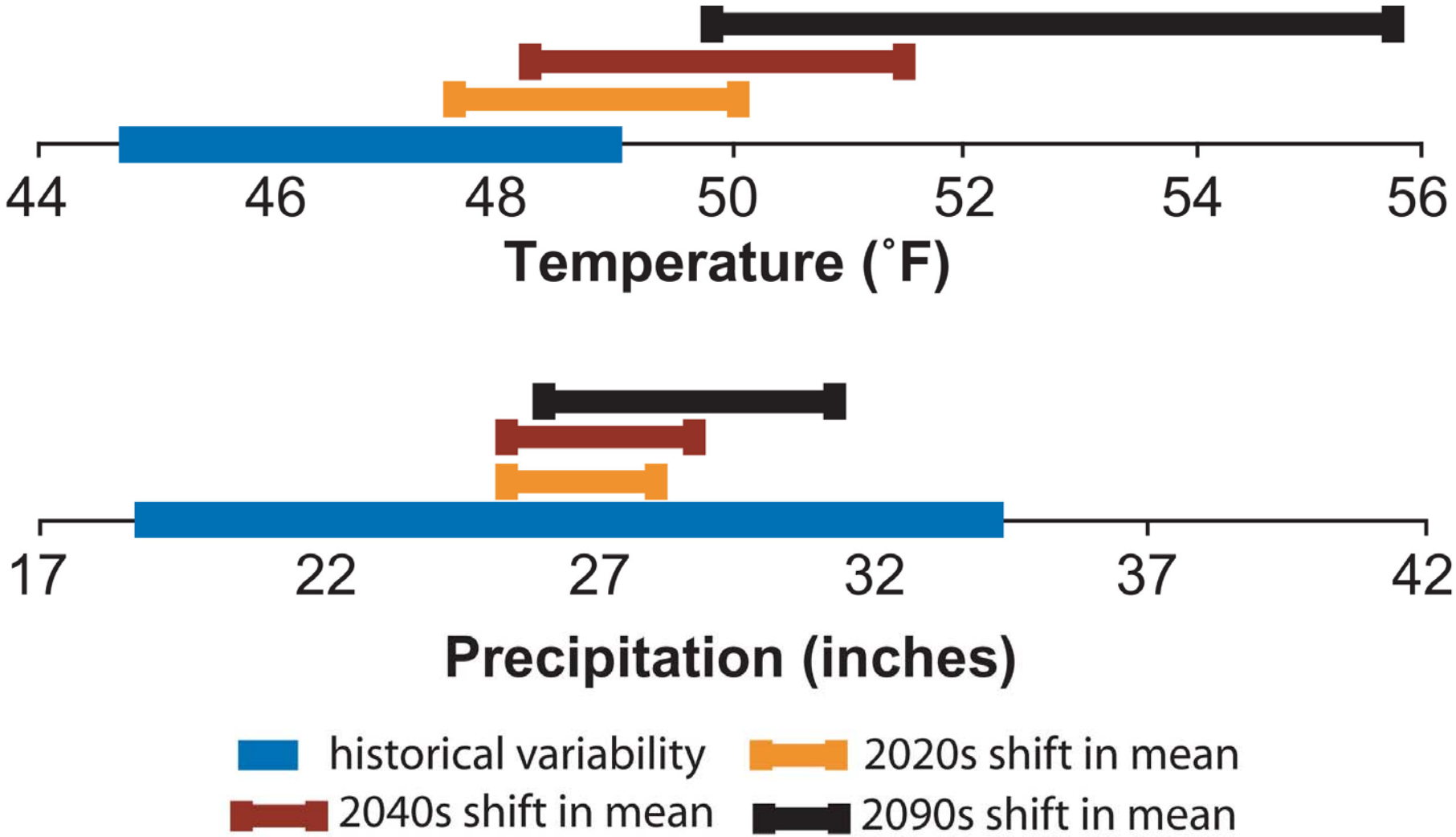
2040s Winter Precipitation Change



2040s Summer Precipitation Change



Range of Projected Climate Change for the Pacific Northwest



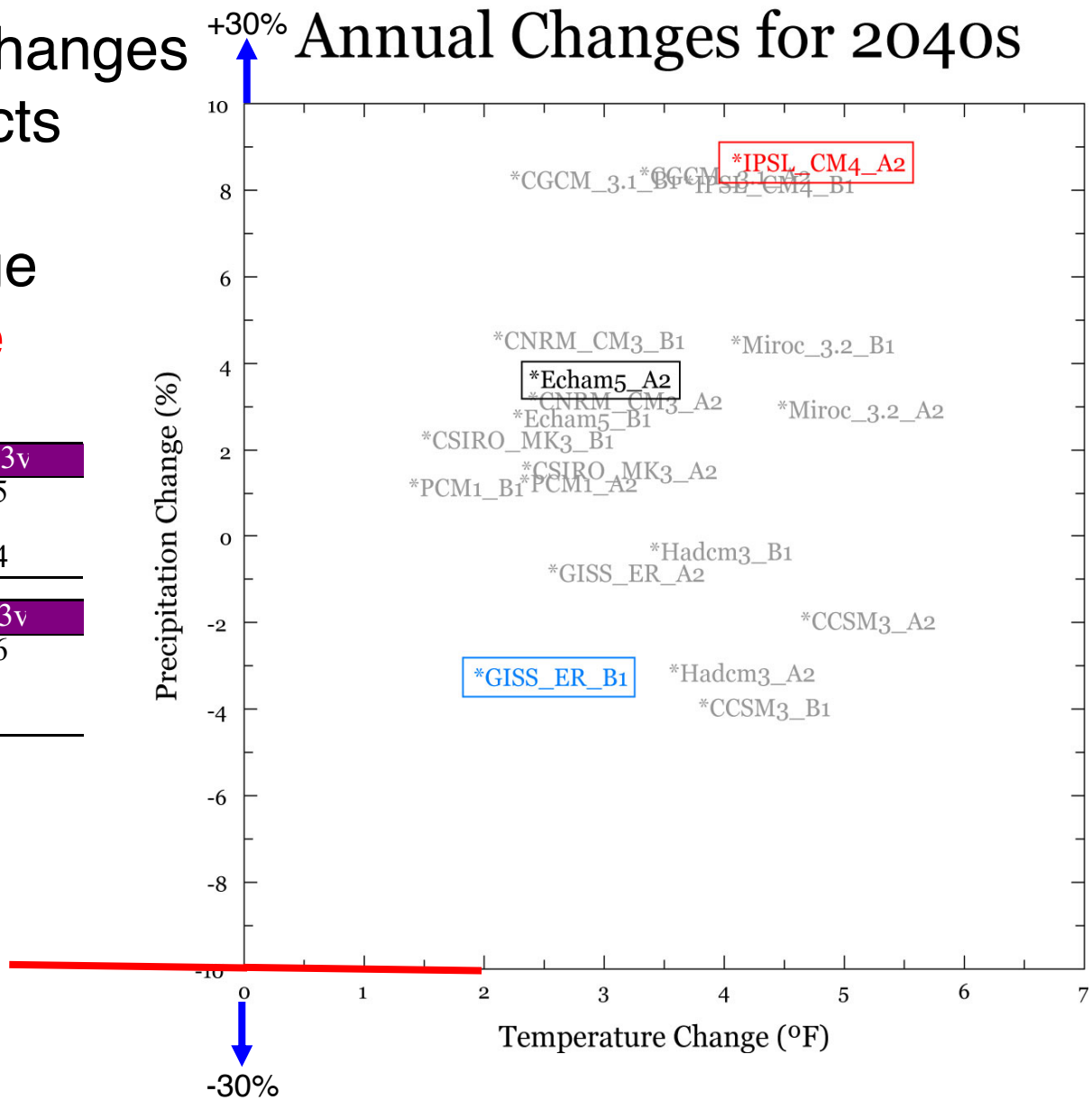
Reference Scenarios

Three Scenarios that represent the range of expected changes for use in detailed impacts studies:

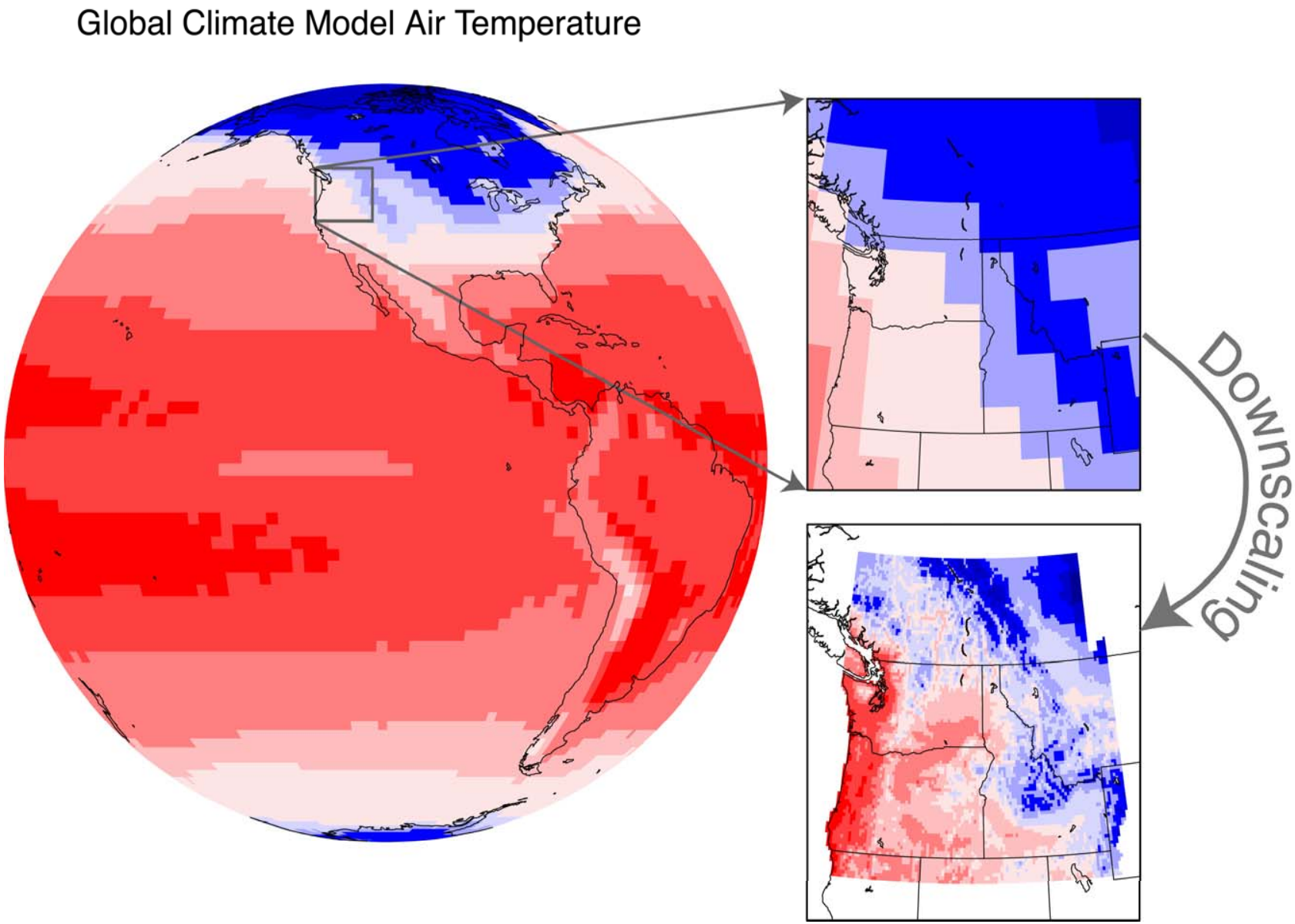
1. **ECHAM5-A2** - Mid-range
2. **IPSL-A2** -- High change
3. **GISS-B1** -- Low change

Wkps hudvxuh +°I,	5353v	5373v	53; 3v
J LVV0E4	41: <	41<4	51<5
HF KDP 0D5	4175	516:	919;
LSVO0D5	5153	7139	; 1: 4

Suhfls lwdlrq -(,	5353v	5373v	53; 3v
J LVV0E4	0315	0616	0316
HF KDP 0D5	413	713	71:
LSVO0D5	914	; 1:	4: 1:



Global models must be downscaled for regional studies



Downscaling Methods Used in CIG

Empirical Downscaling

ˇ Assumes climate model captures temperature and precipitation trends

ˇ Quick: Can do many scenarios

ˇShares uncertainties with global models

Regional Climate Model

ˇ Based on MM5 regional weather model

ˇ Represents regional weather processes

ˇ May produce local trends not depicted by global models

ˇ Additional modeling layer adds bias and uncertainty

SUMMARY

- Projected Pacific Northwest warming: 1/4 to 1 ºF/decade
- Probably more warming in Summer than Winter
- Precipitation changes uncertain – Possibly wetter winters and drier summers