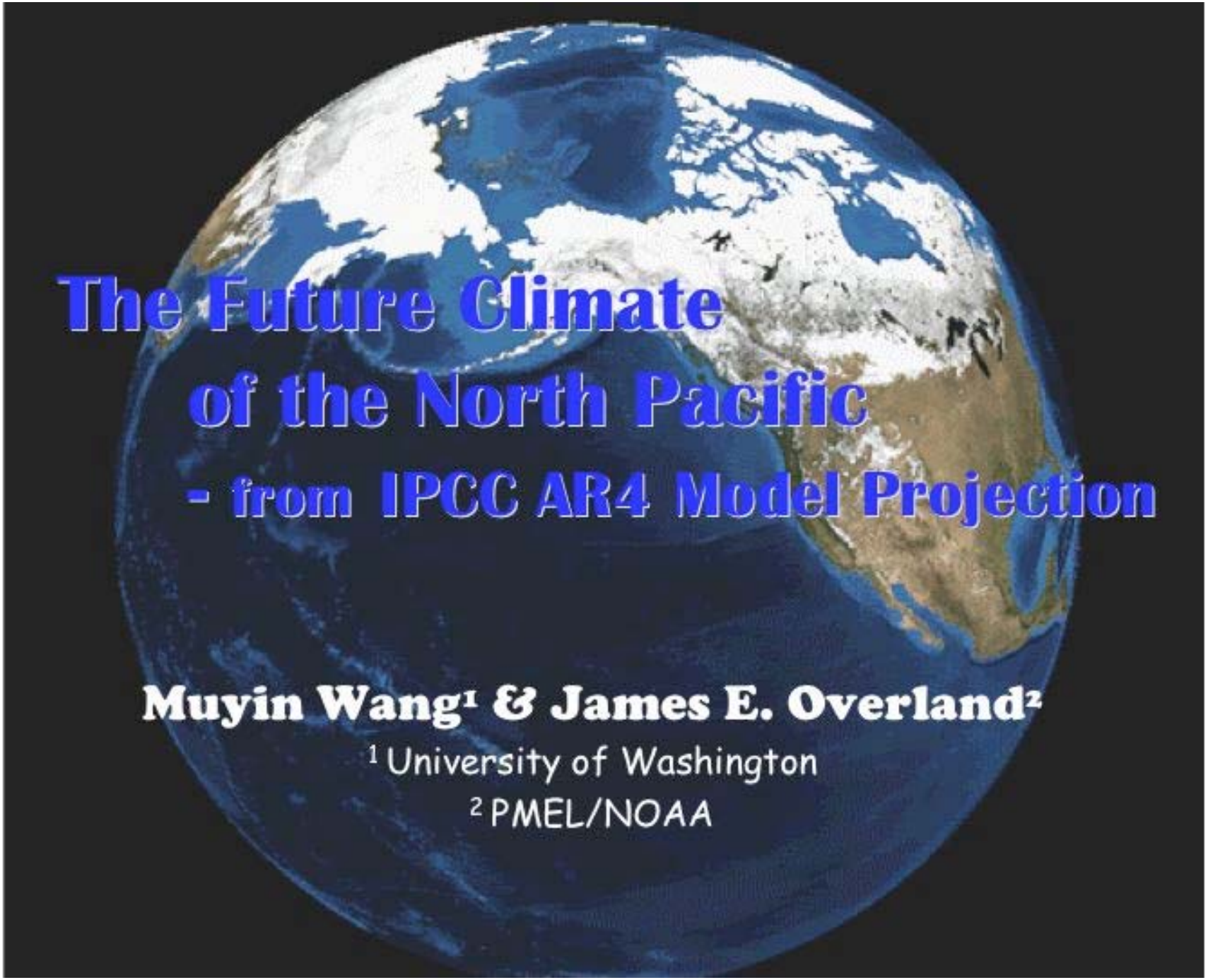


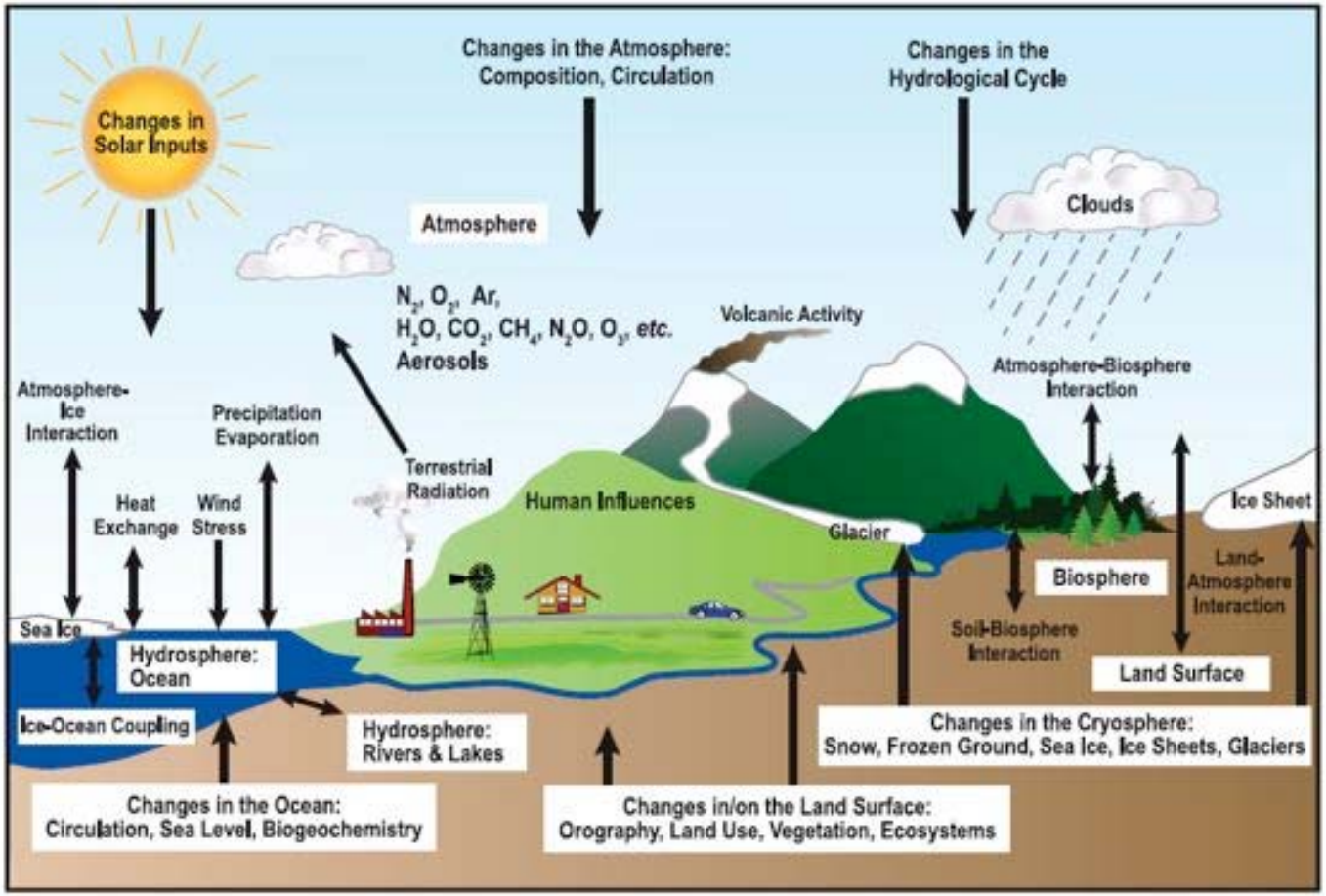
The Future Climate of the North Pacific
- from IPCC AR4 Model Projection

Muyin Wang[1] & James E. Overland[2]

[1] University of Washington

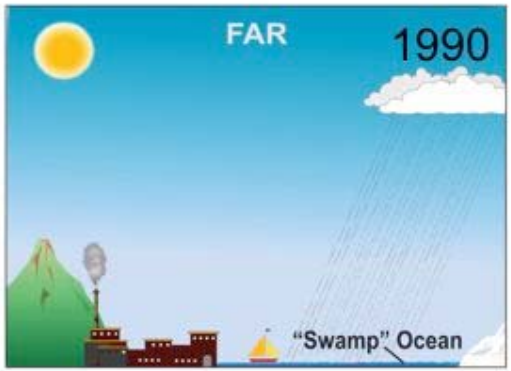
[2] PMEL/NOAA

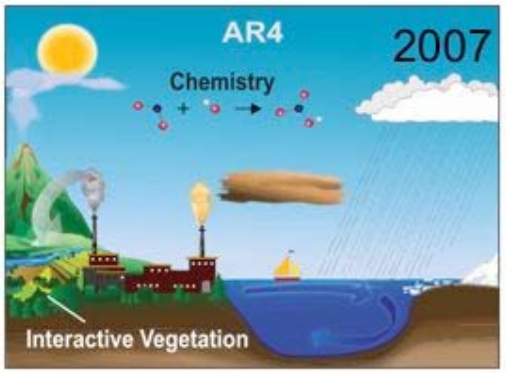
What is a coupled climate model?

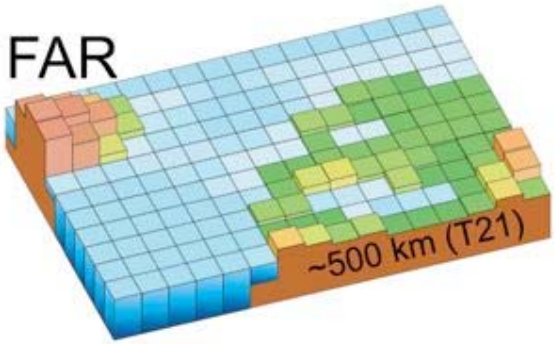


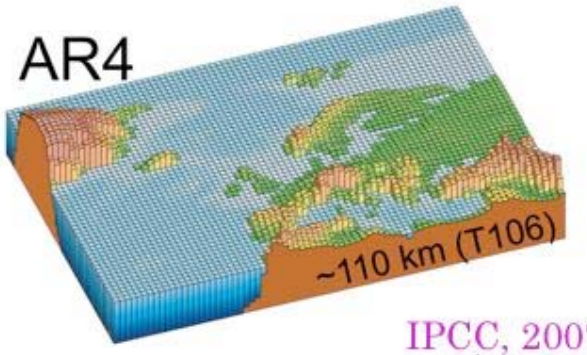
IPCC, 2007

The Progress of Climate Models



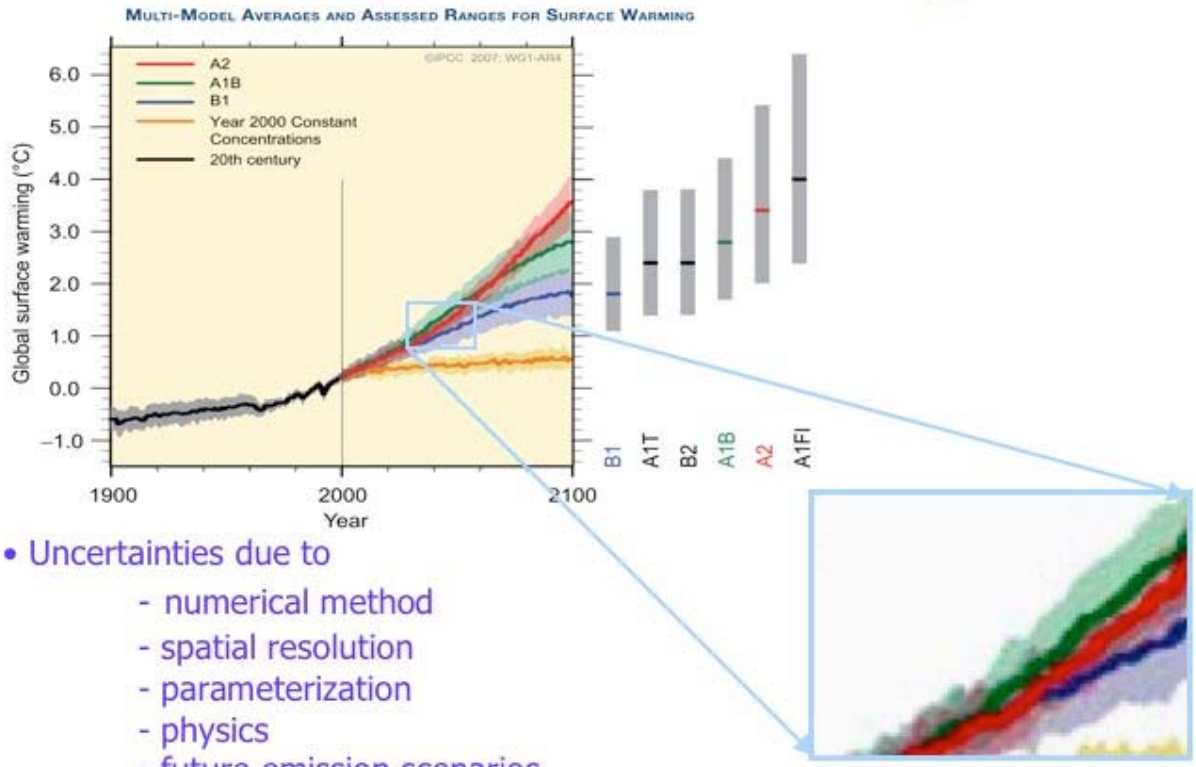






IPCC, 2007

Multi-model Mean and Assessed Ranges for Global Surface Warming



- Uncertainties due to
  - numerical method
  - spatial resolution
  - parameterization
  - physics
  - future emission scenarios
- Uncertainties due to forced and unforced natural variability.

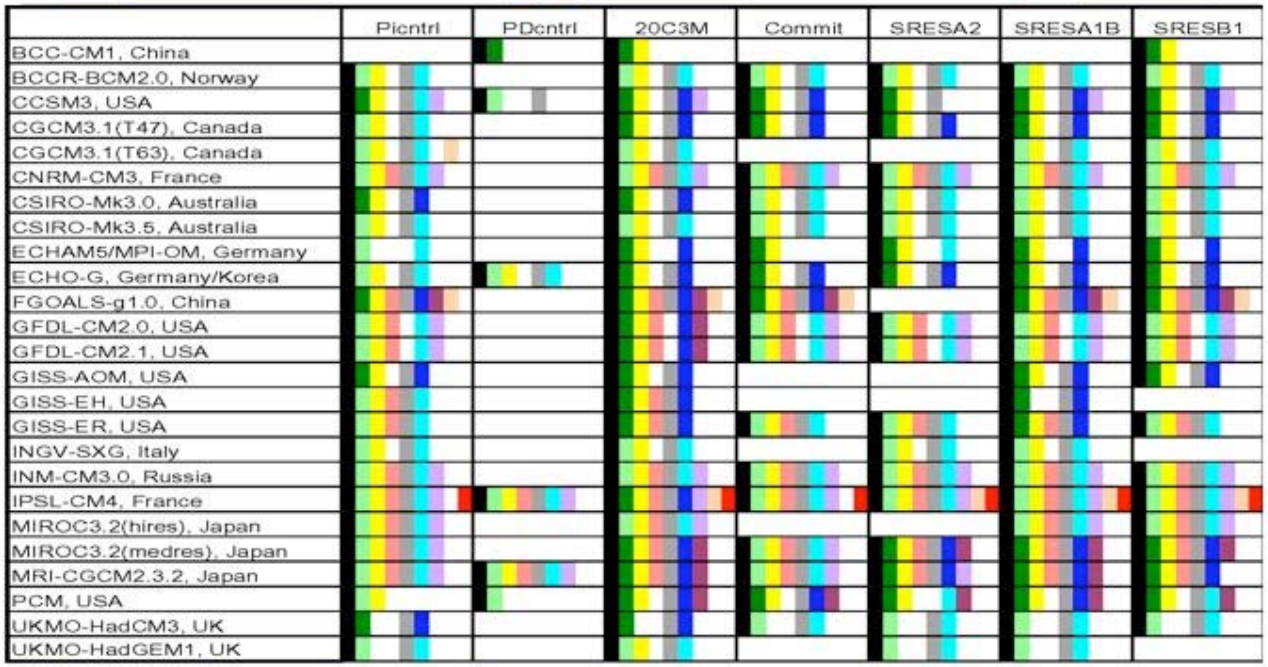
IPCC, 2007

Models Contributed to IPCC AR4

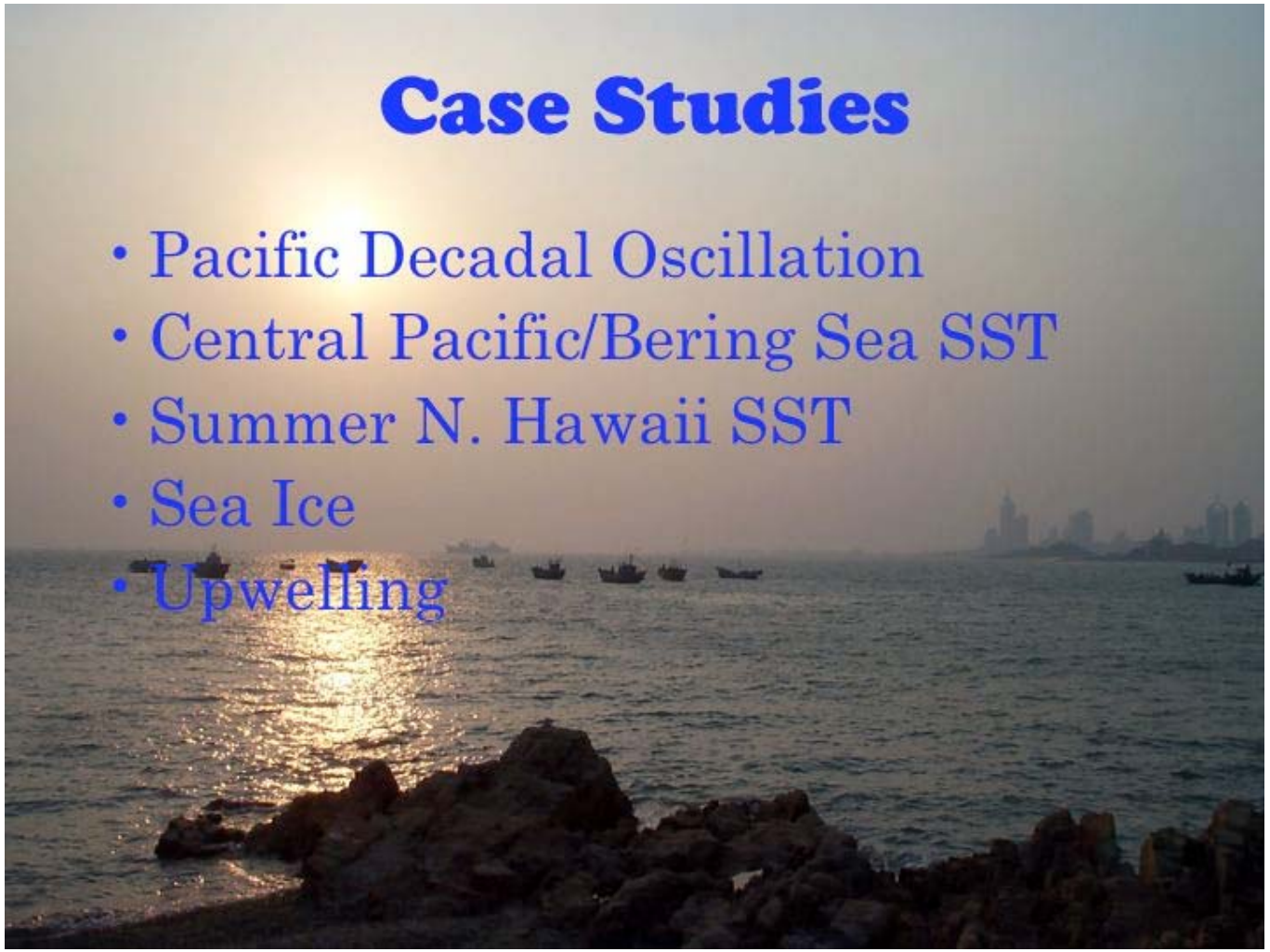
Data Availability Summary **(as of 16 July 2007)**

shaded area indicates that at least some but not necessarily all fields are available for data type indicated

time-independent land surface
monthly-mean atmosphere
daily-mean atmosphere
3-hourly atmosphere
time-independent ocean
monthly-mean ocean
Extreme Indices
Forcing
ISCCP Simulator

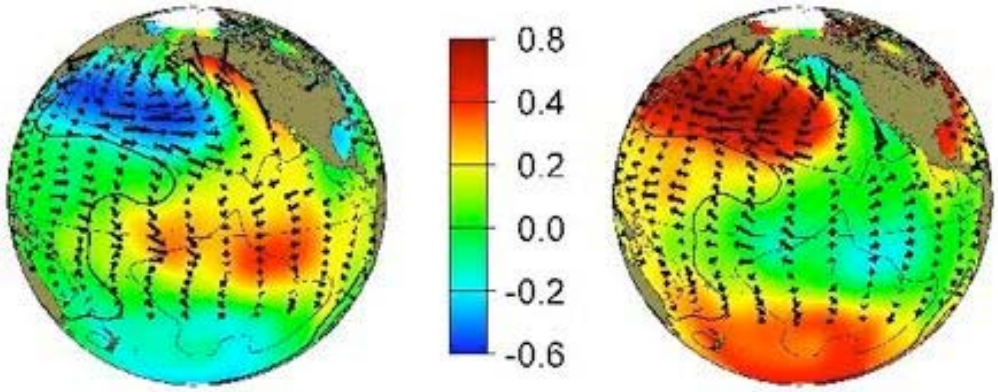


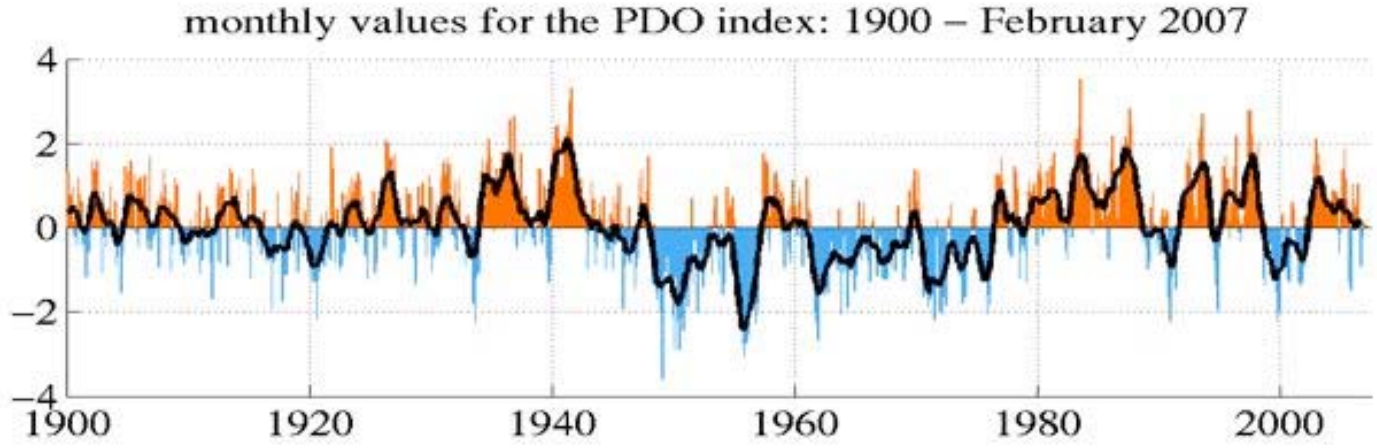
Unprecedented model experiment:
25 models, 18 centers, 13 countries


Case Studies
• Pacific Decadal Oscillation
• Central Pacific/Bering Sea SST
• Summer N. Hawaii SST
• Sea Ice
• Upwelling

Major Mode of SST Variability

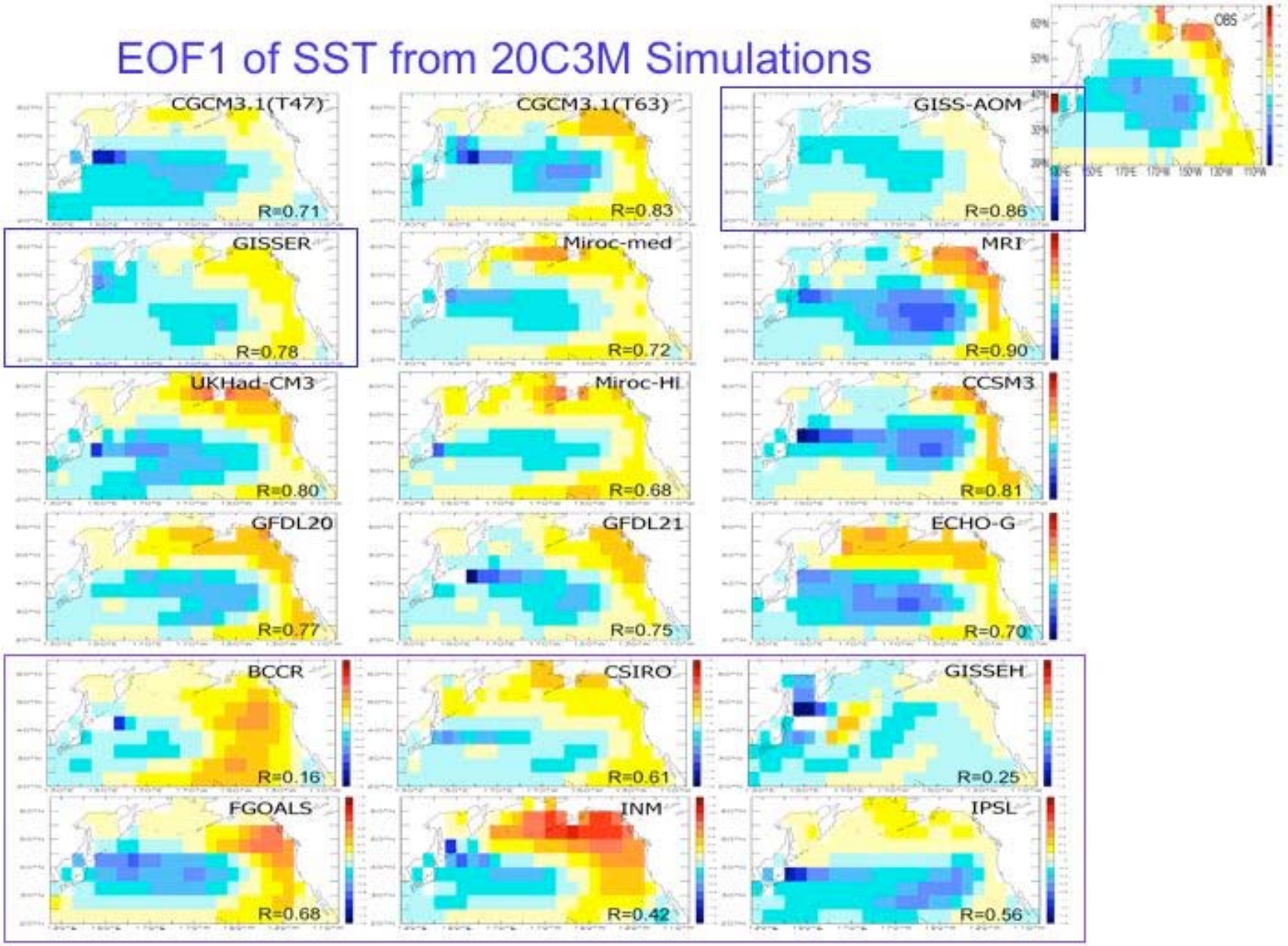
North Pacific



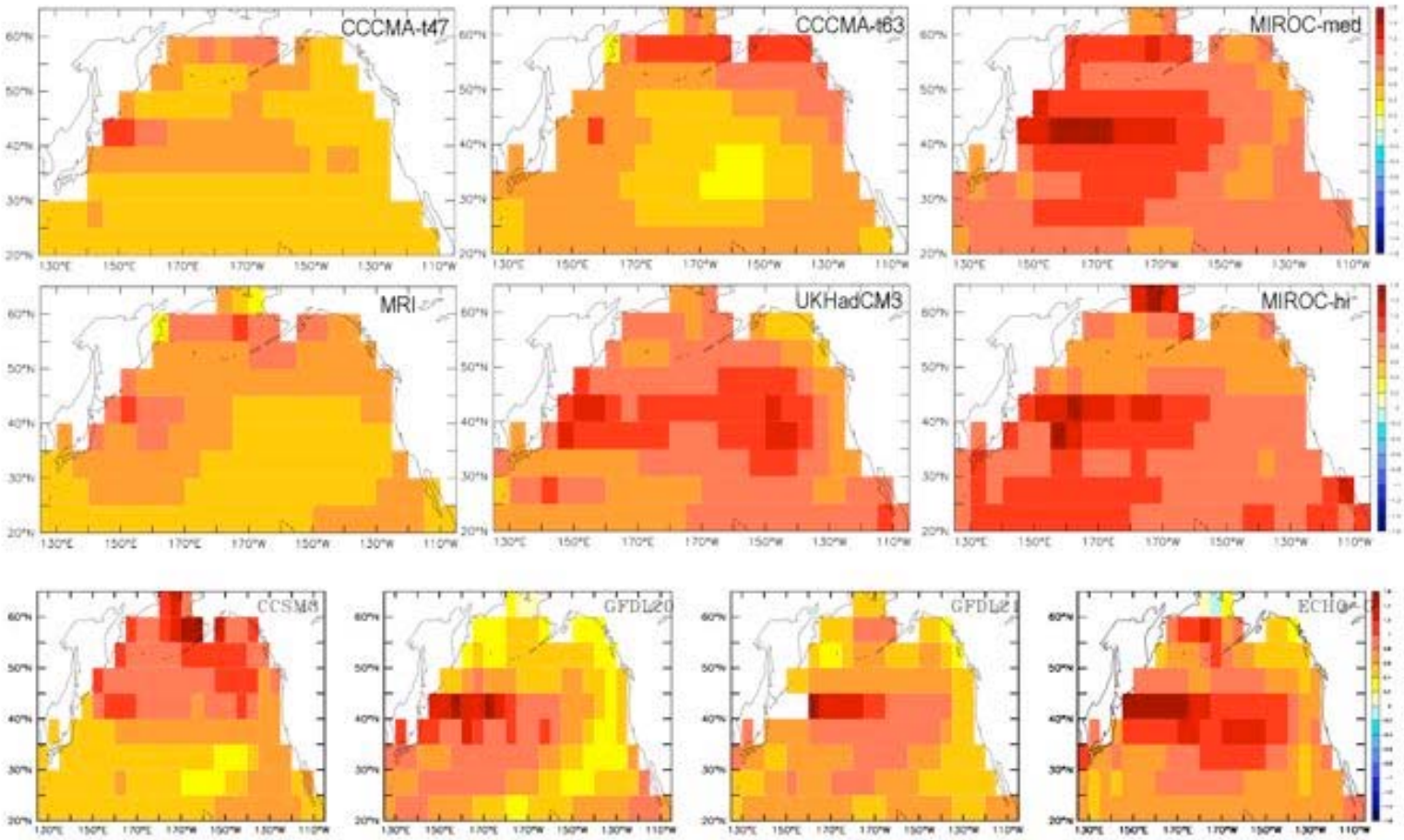


http://jisao.washington.edu/pdo/

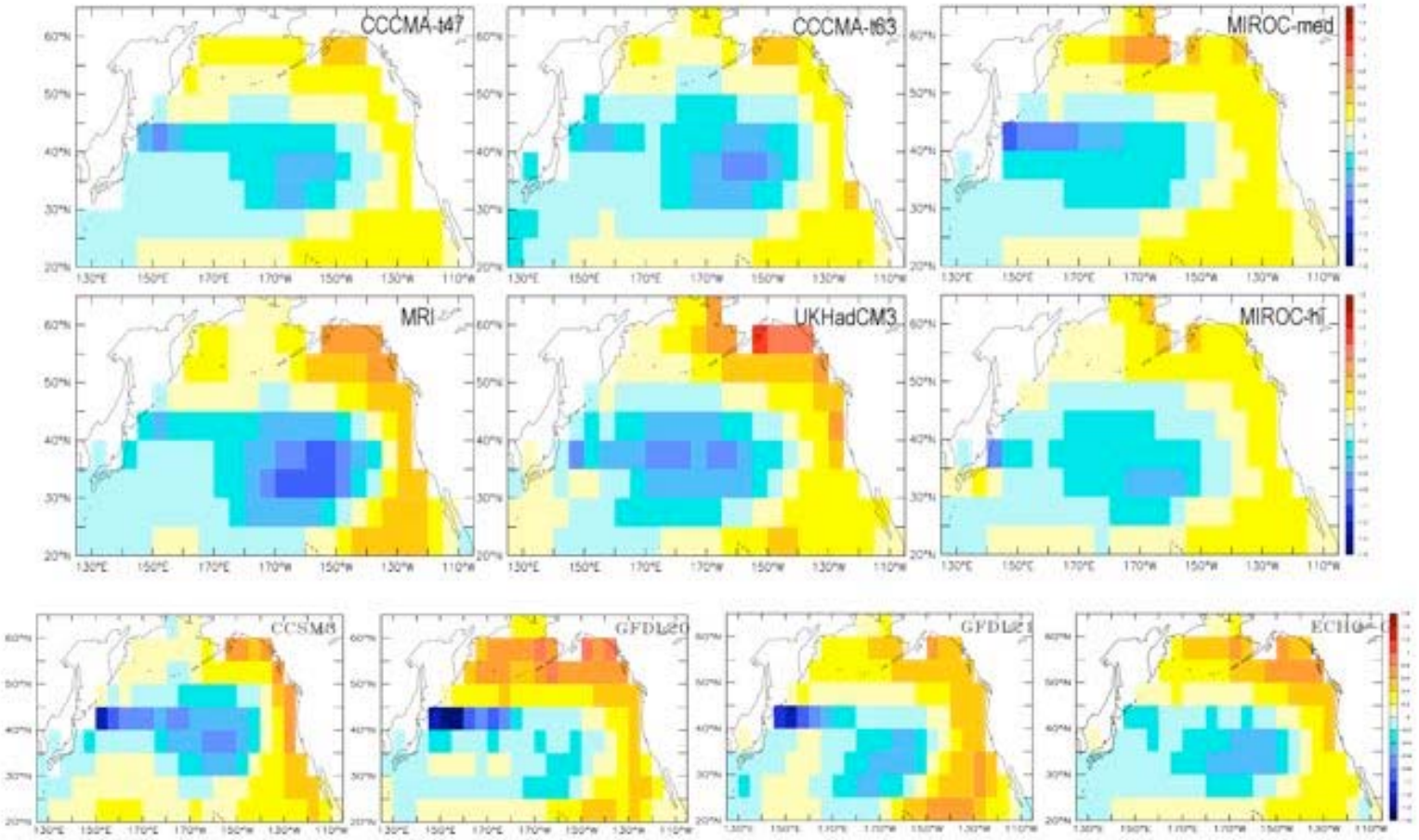
EOF1 of SST from 20C3M Simulations



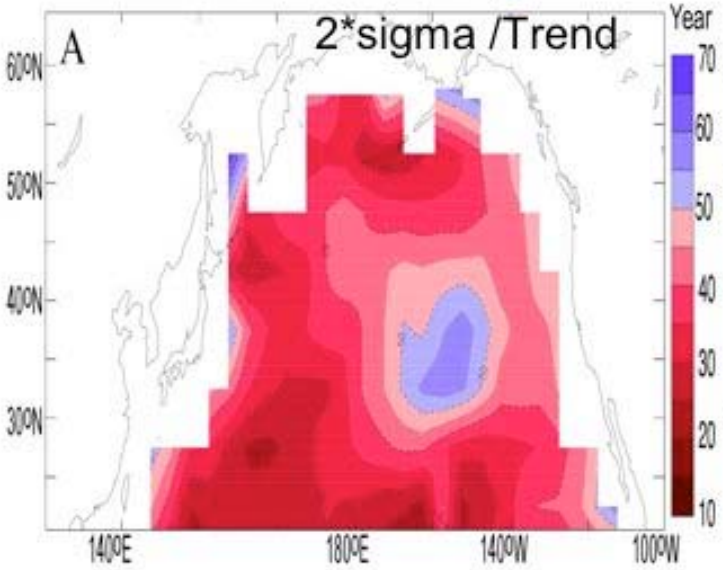
EOF1 of SST for 2001-2099 in A1B



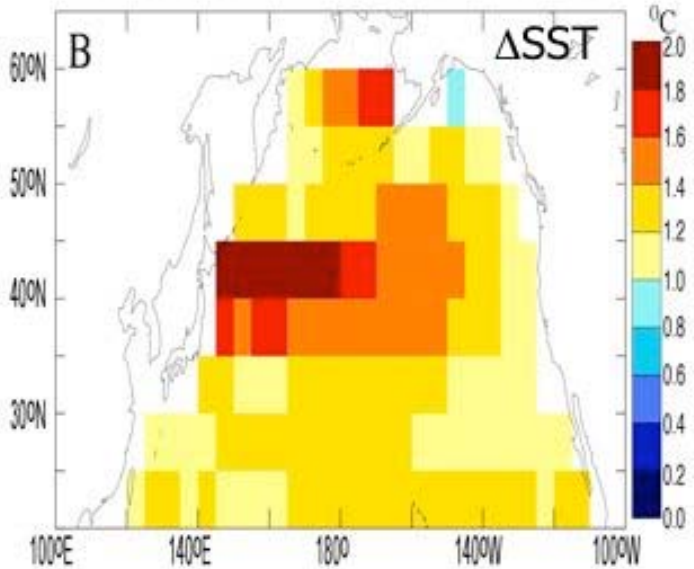
EOF2 of SST for 2001-2099 in A1B



Estimate of years when trend over pass the magnitude of natural variability

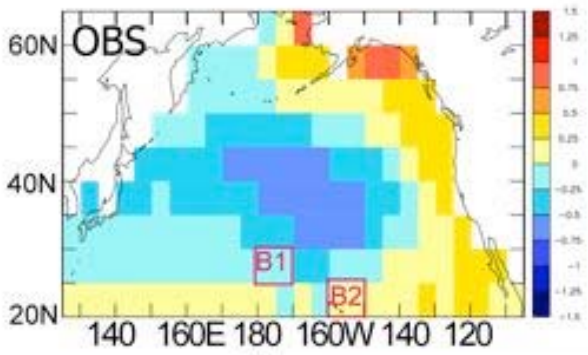


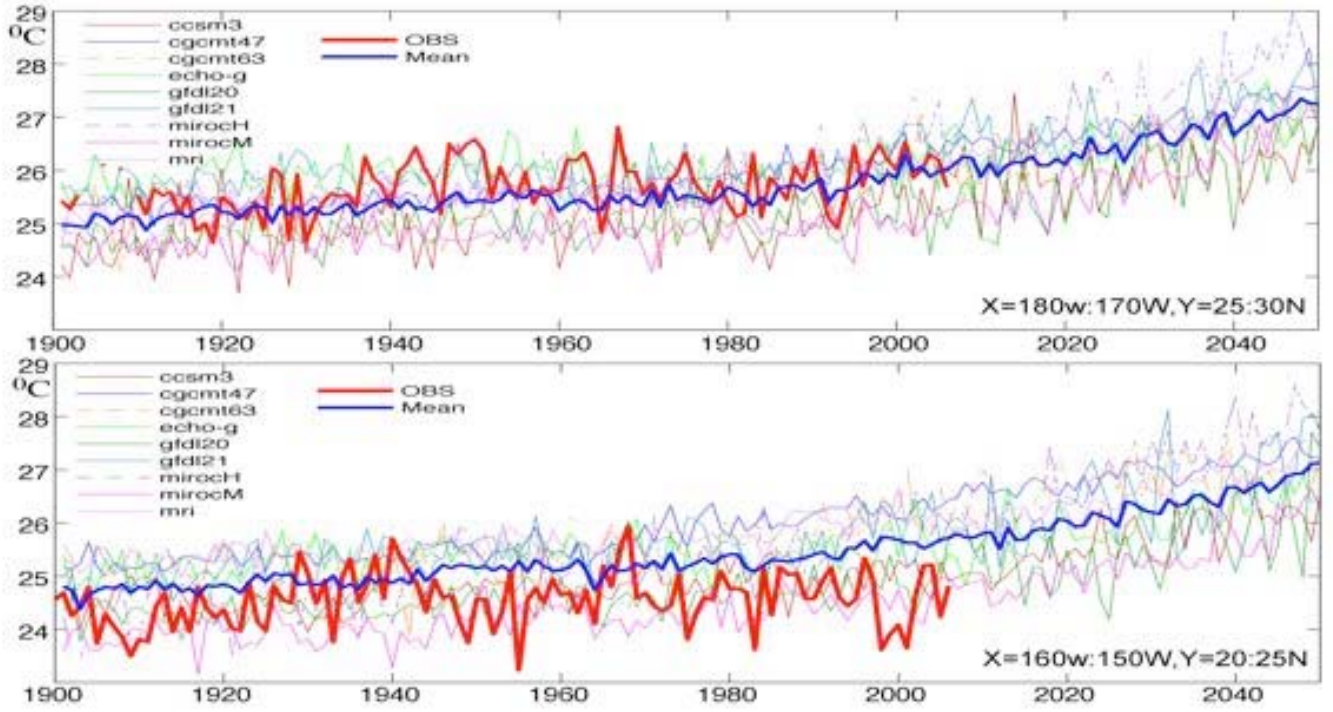
Projected SST Change by Models Winter SST Anomaly 2040-49 minus 1980-99



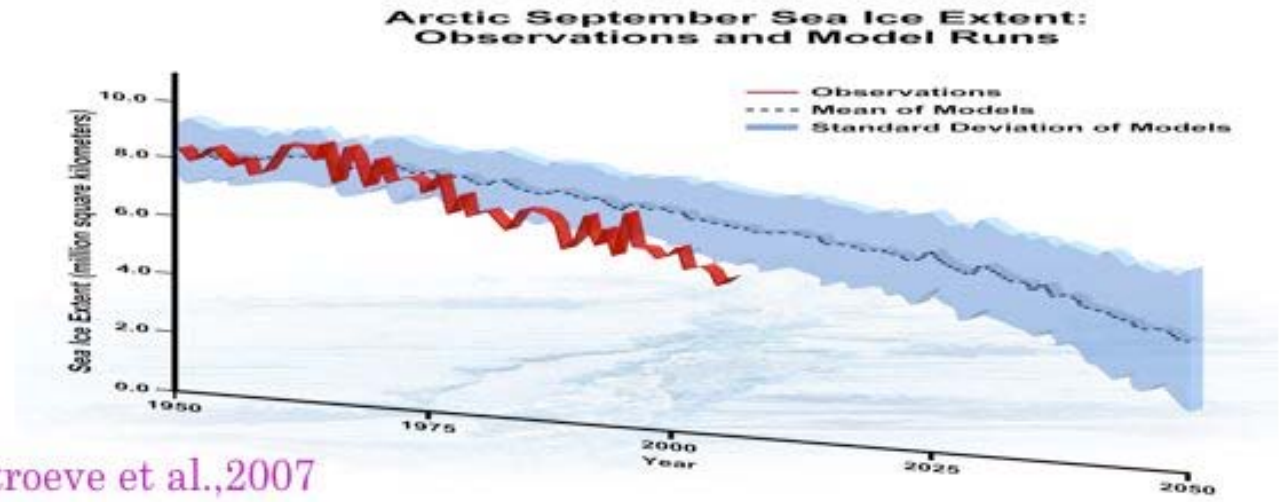
Overland and Wang, 2007

Maximum SST near N. of Hawaii Summer (Aug.- Oct.)

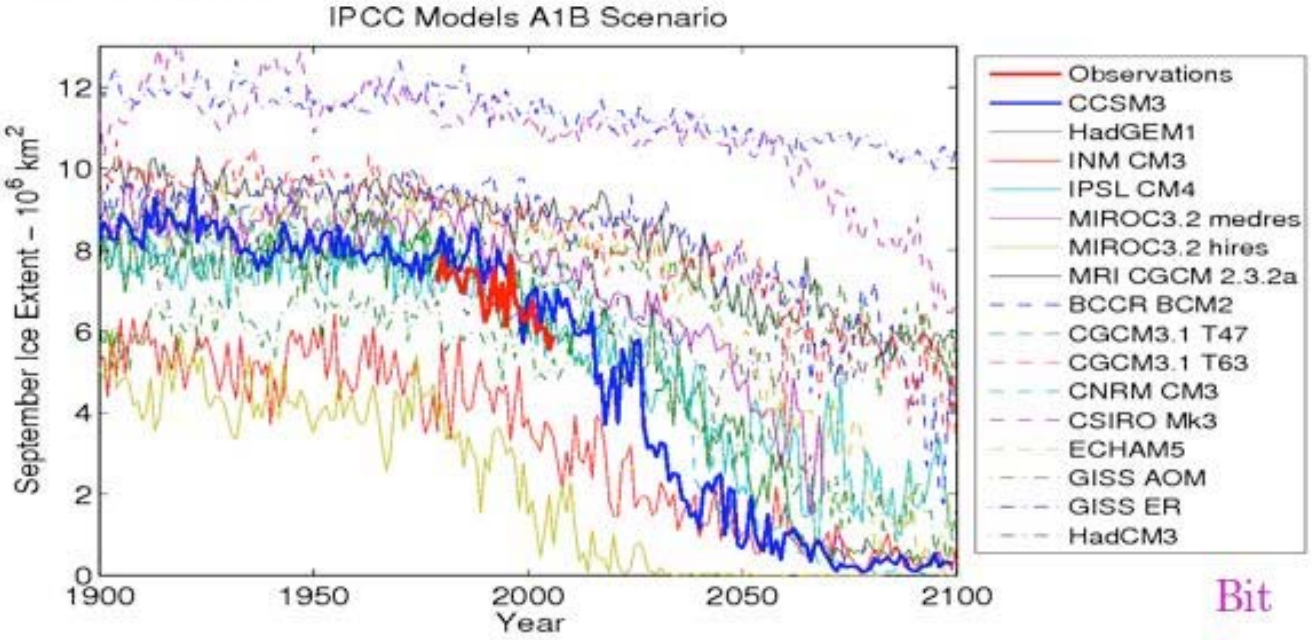




Wang et al, 2007



Stroeve et al.,2007



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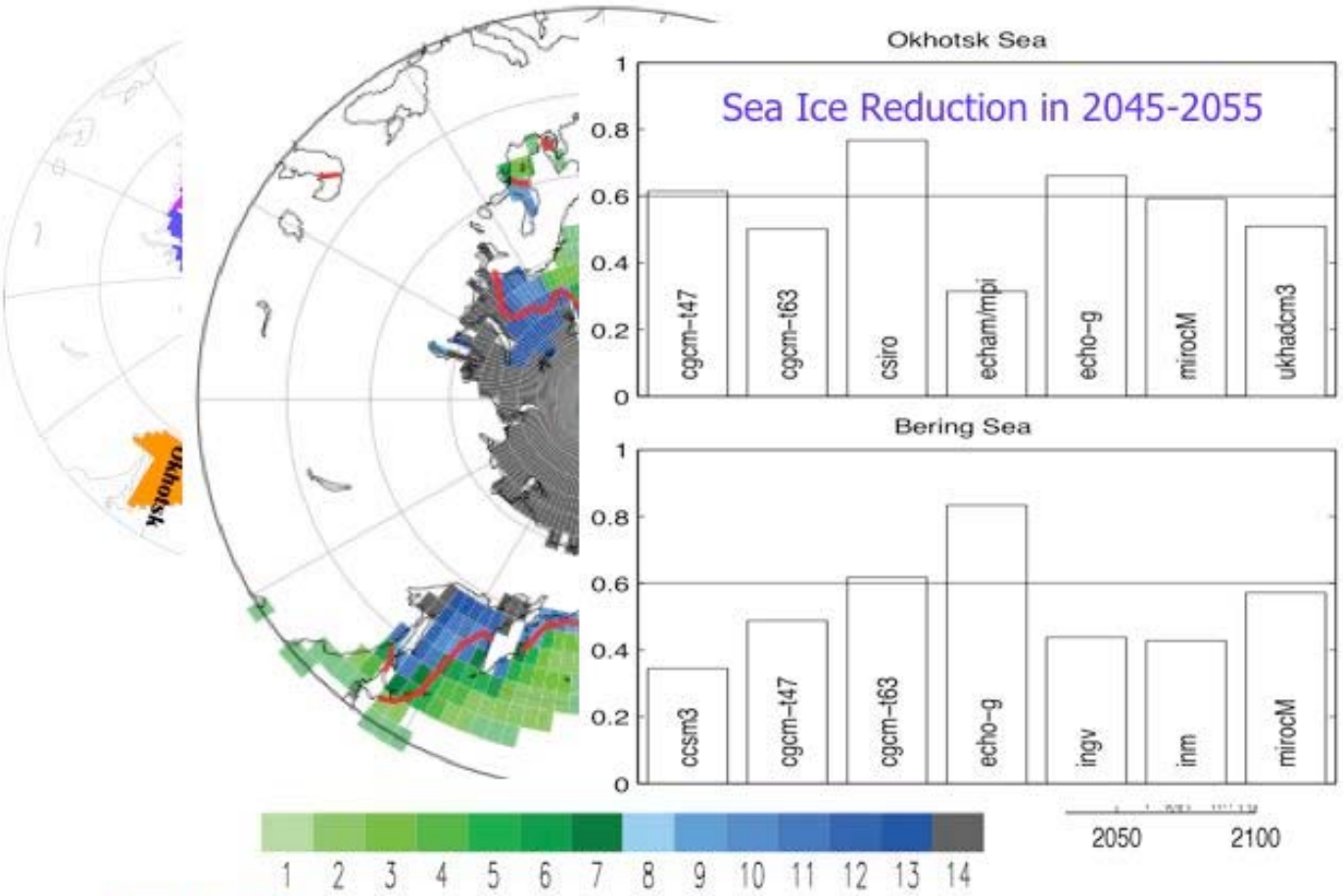
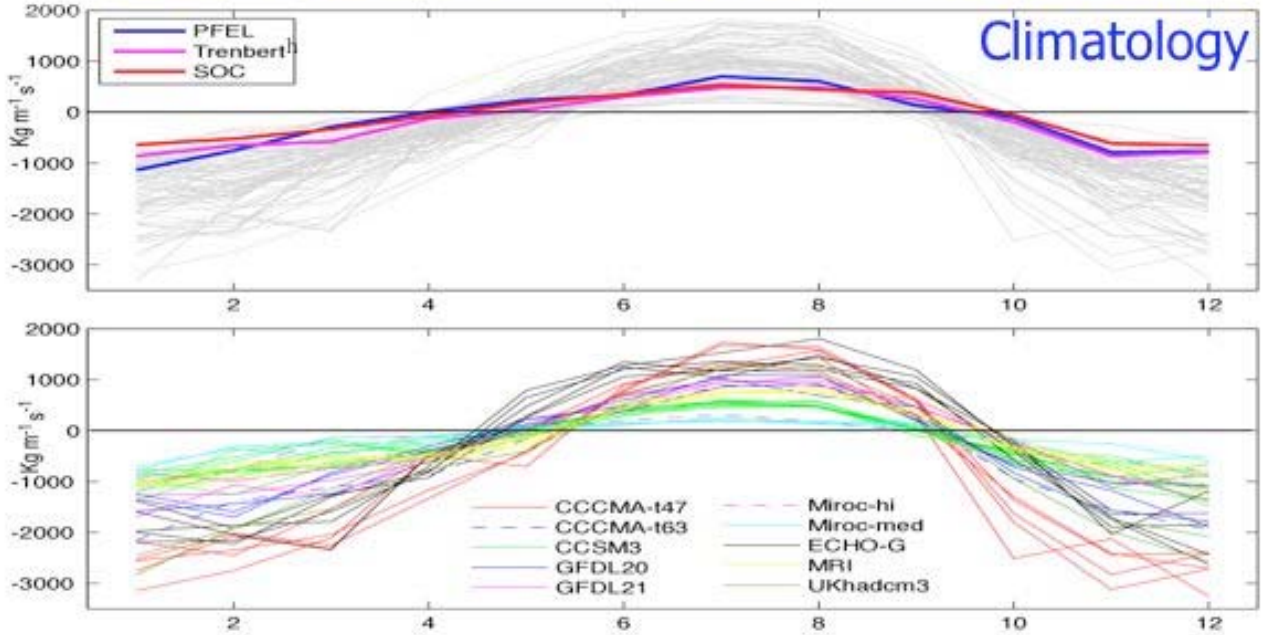
Winter Sea ice Area



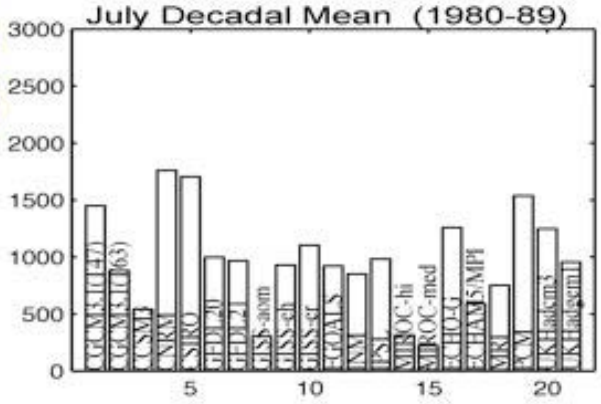
IPCC, 2007

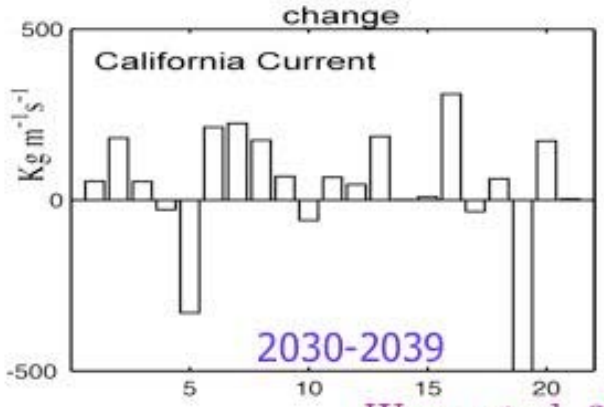
Wang, 2007

Upwelling Index near Oregon Coast 45N, 125W



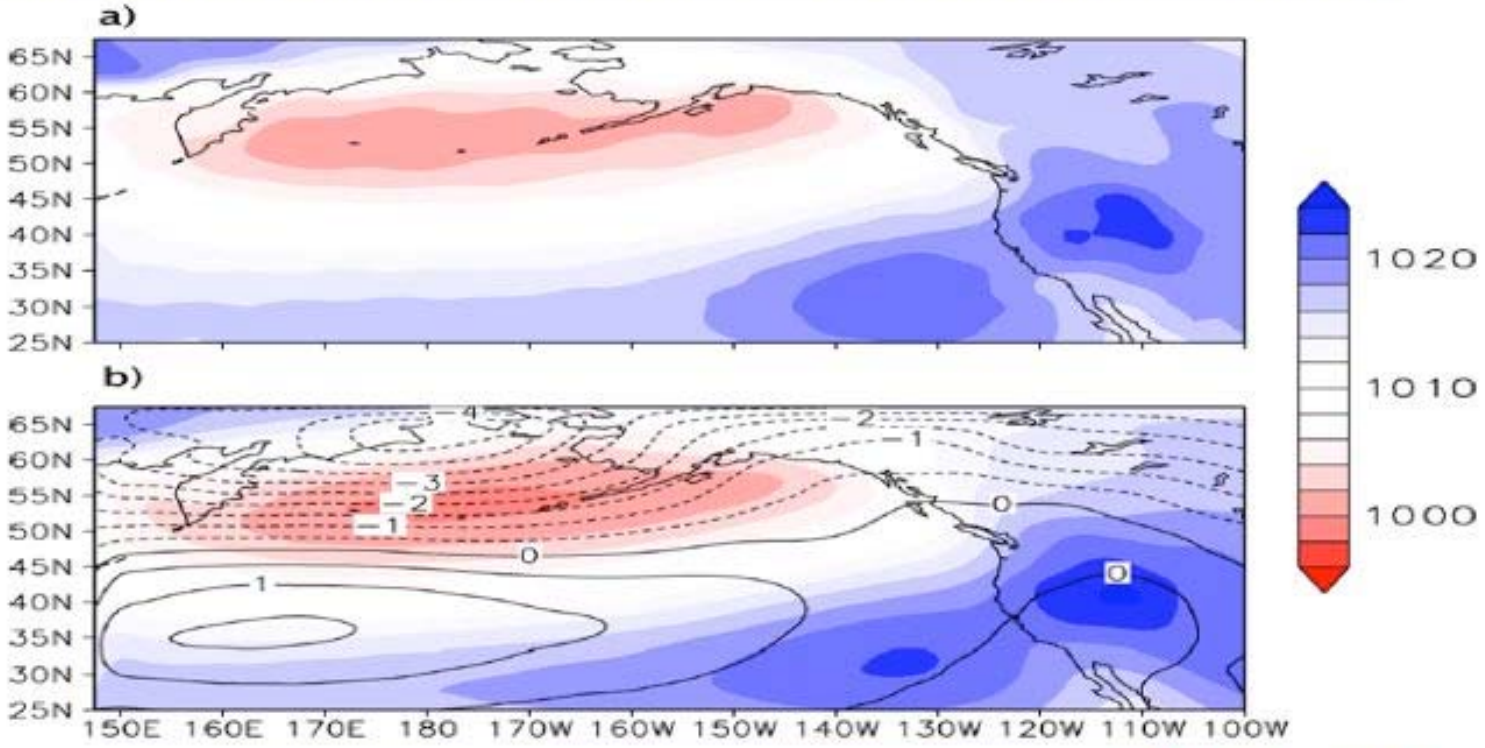
Possible changes





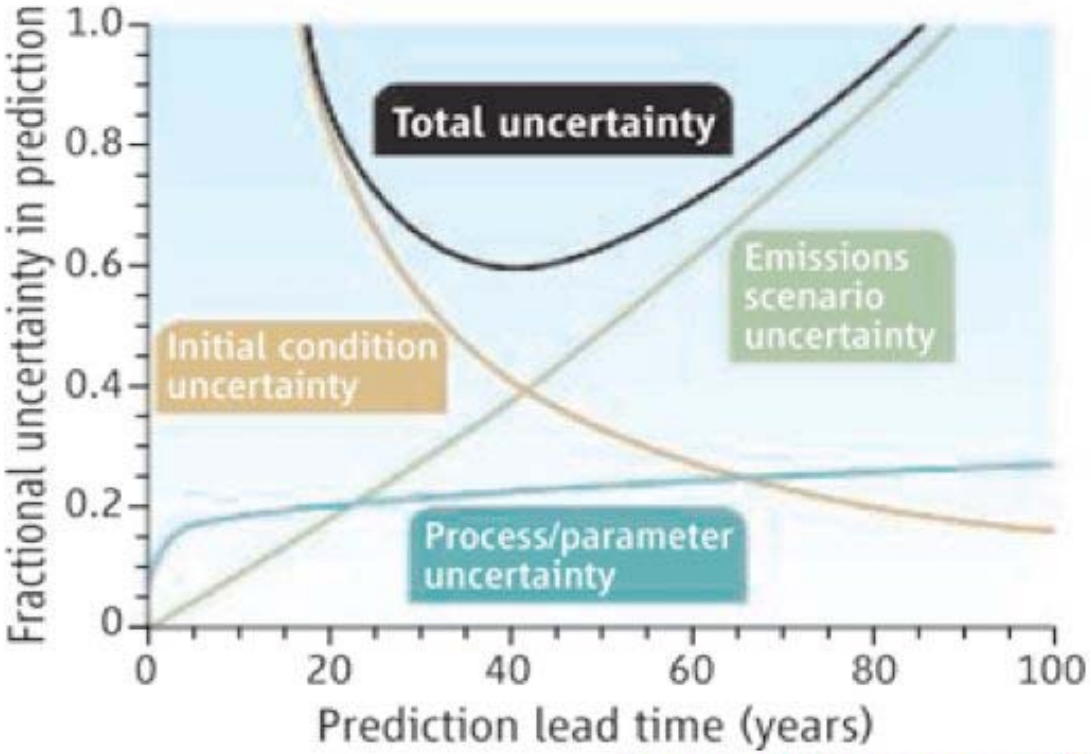
Wang et al, 2007

Difference in Sea Level Pressure
2050-2100 Minus 1950-2000
Winds are a factor in second half of century

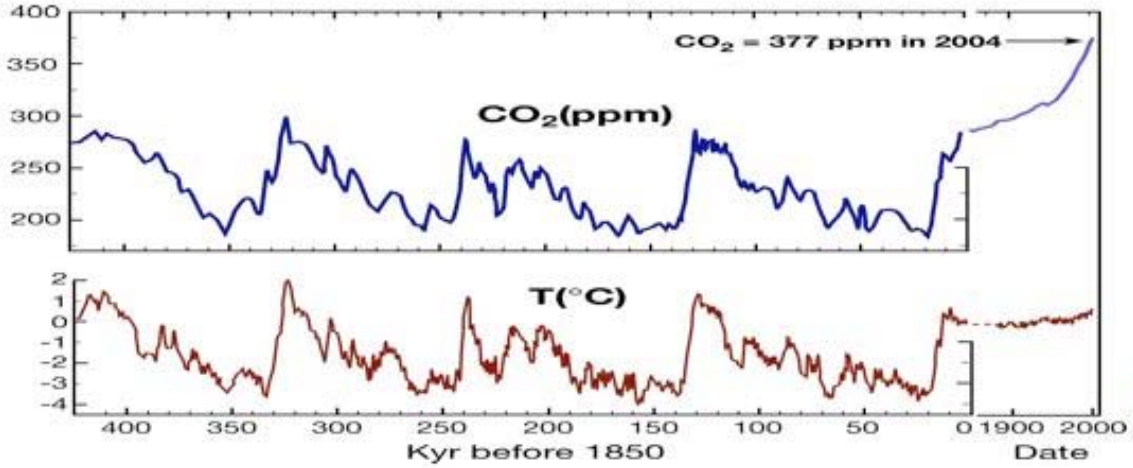


Salathe, 2006

Fractional Uncertainty in Prediction

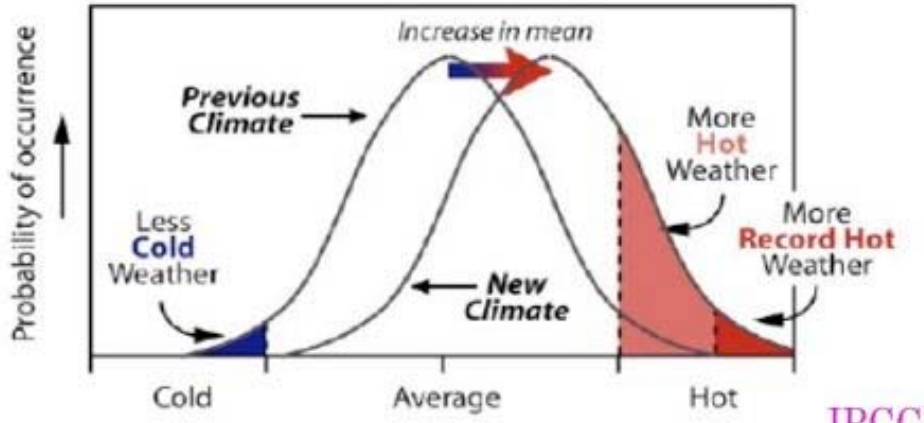


Cox and Stephenson, 2007



Dessler, 2006

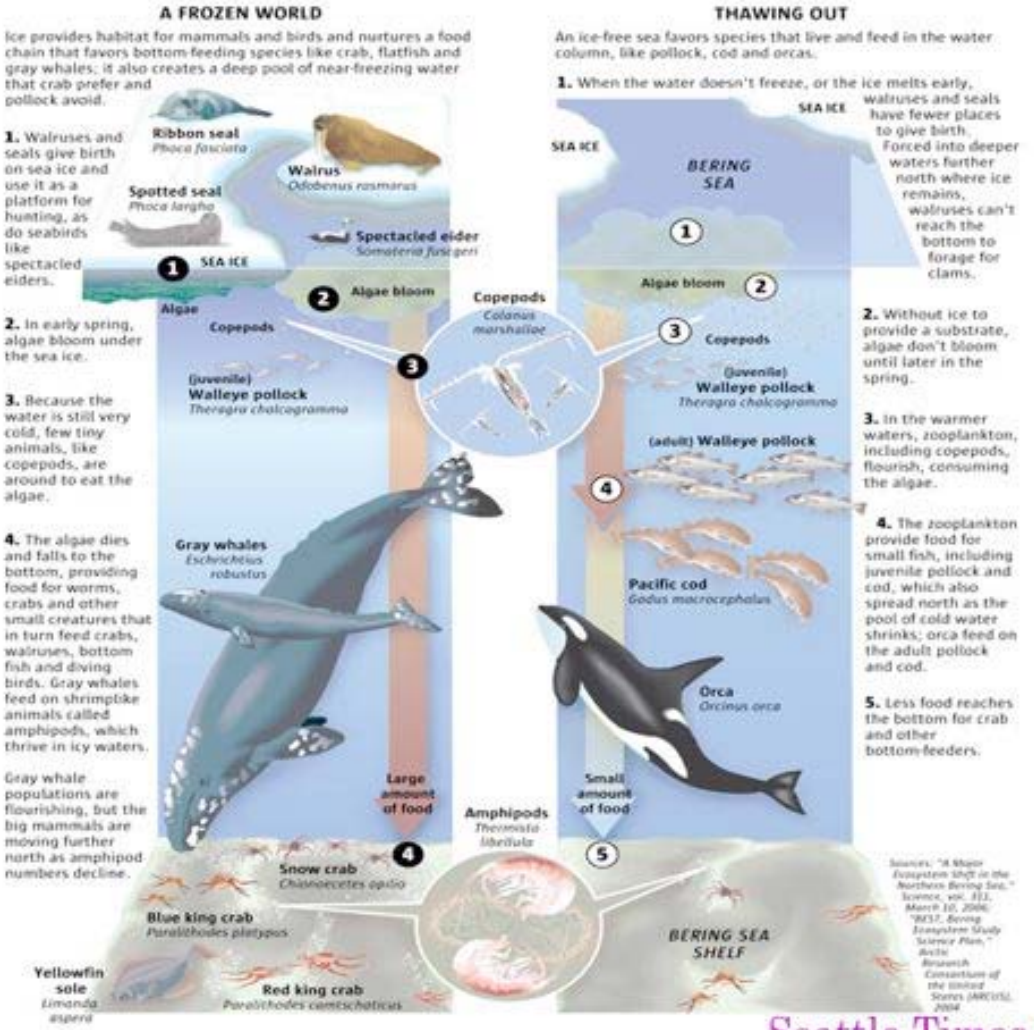
How do extremes change with the mean?



IPCC, 2007

Change in the nation's "fish basket"

Rising temperatures are transforming Alaska's Bering Sea, the source of half of America's seafood and the mainstay of Seattle's fishing industry. Crab, flatfish, walrus and seal populations are suffering while pollock and cod are on the rise.



Seattle Times Oct. 1, 2006