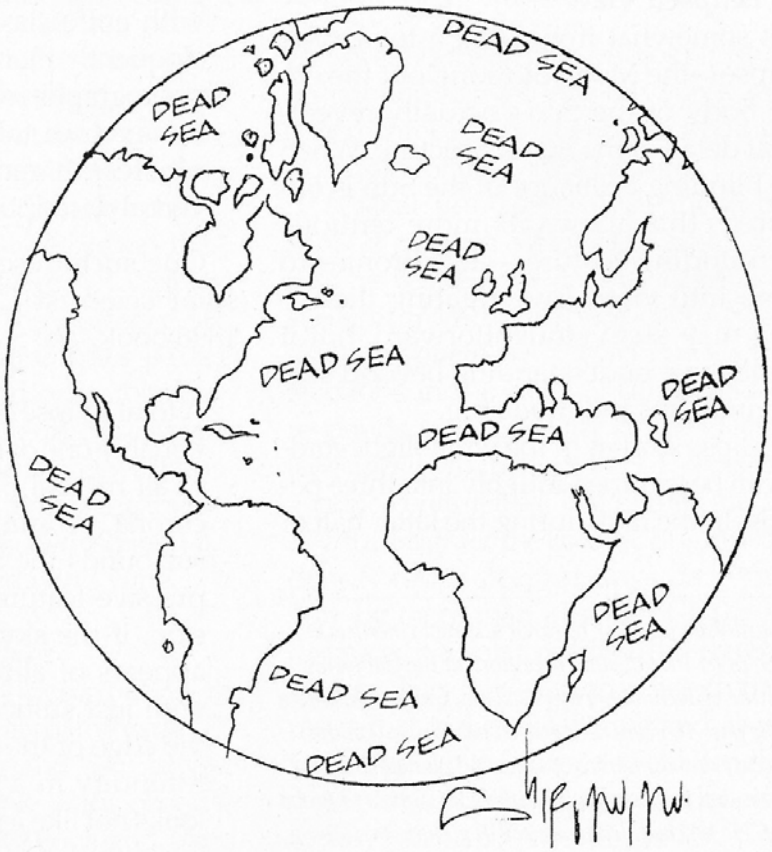
TODAY



TOMORROW?

BEST-BSIERP Bering Sea Project

bsierp.nprb.org

Future Recruitment of Bering Sea Walleye Pollock: Part II: Ranges in Key Environmental Parameters from Global Climate Model Forecasts

Nick Bond[1], Franz Mueter[2], Anne Hollowed[3]
Muyin Wang[1], Carol Ladd[4]

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[2] School of Fisheries & Ocean Sciences, UAF

[3] Alaska Fisheries Science Center, NOAA

[4] Pacific Marine Environmental Laboratory, NOAA

Uncertainties and Errors in Projections

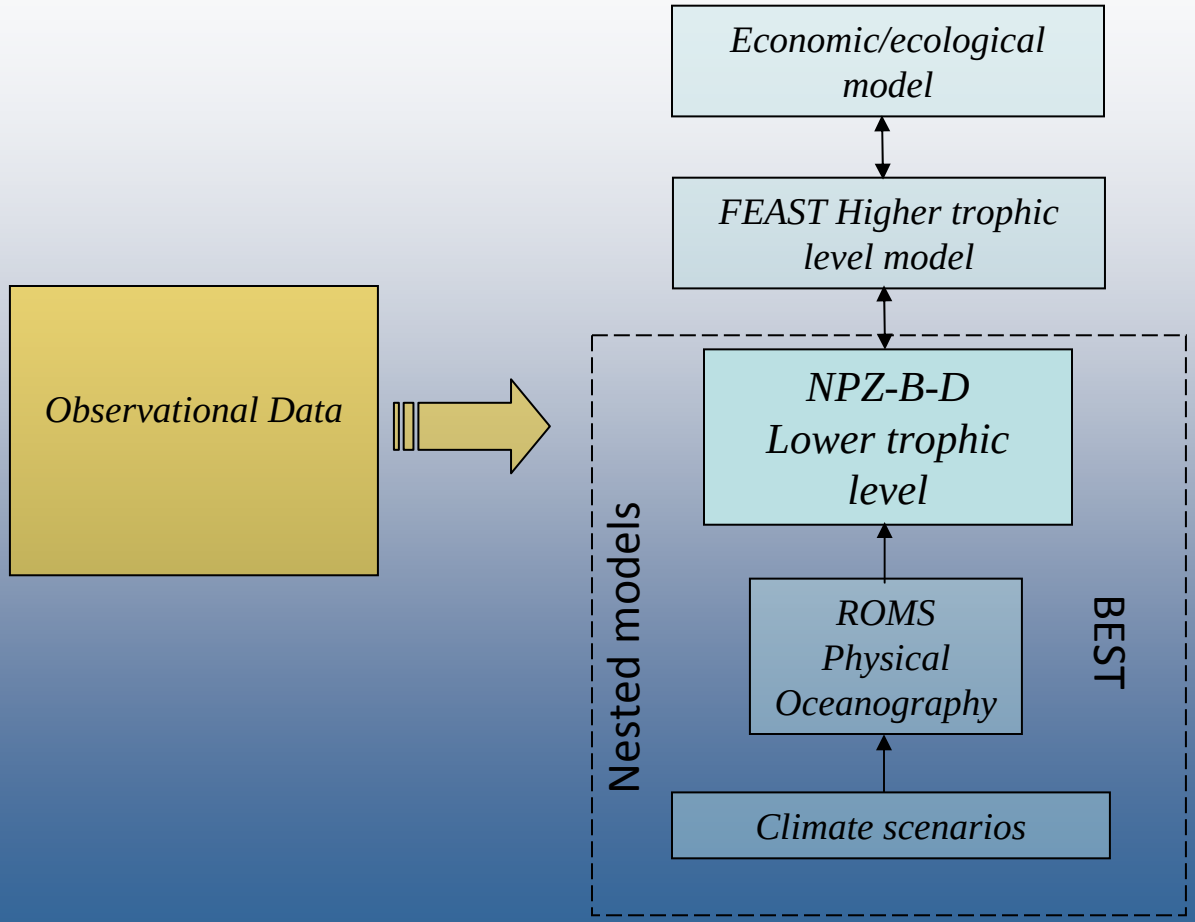
Physical Sources

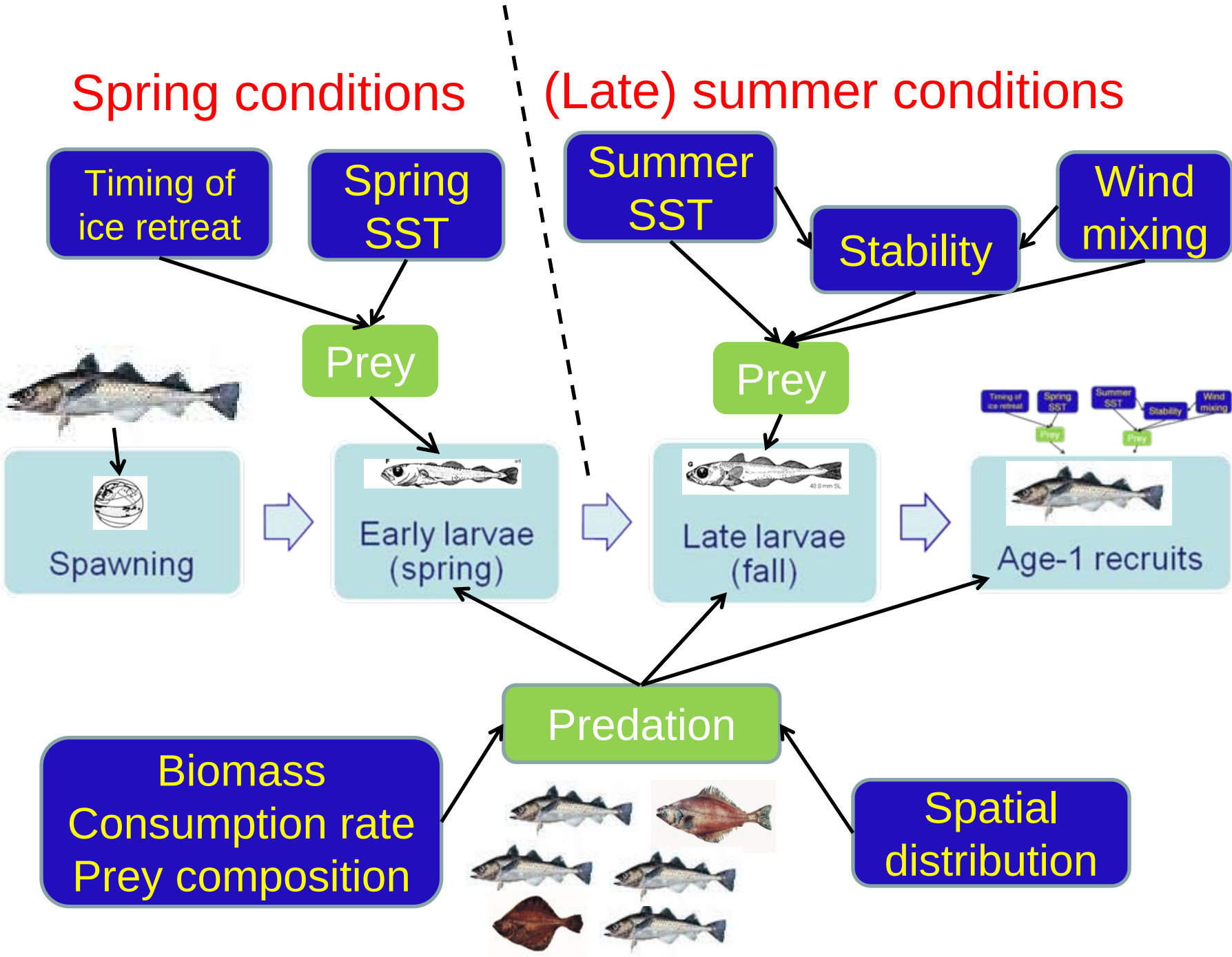
- Human factors (e.g., CO_2 emissions)
- Global mean climate
- Regional climate (seasonality, variability, etc.)
- Local conditions (specific parameters of importance)

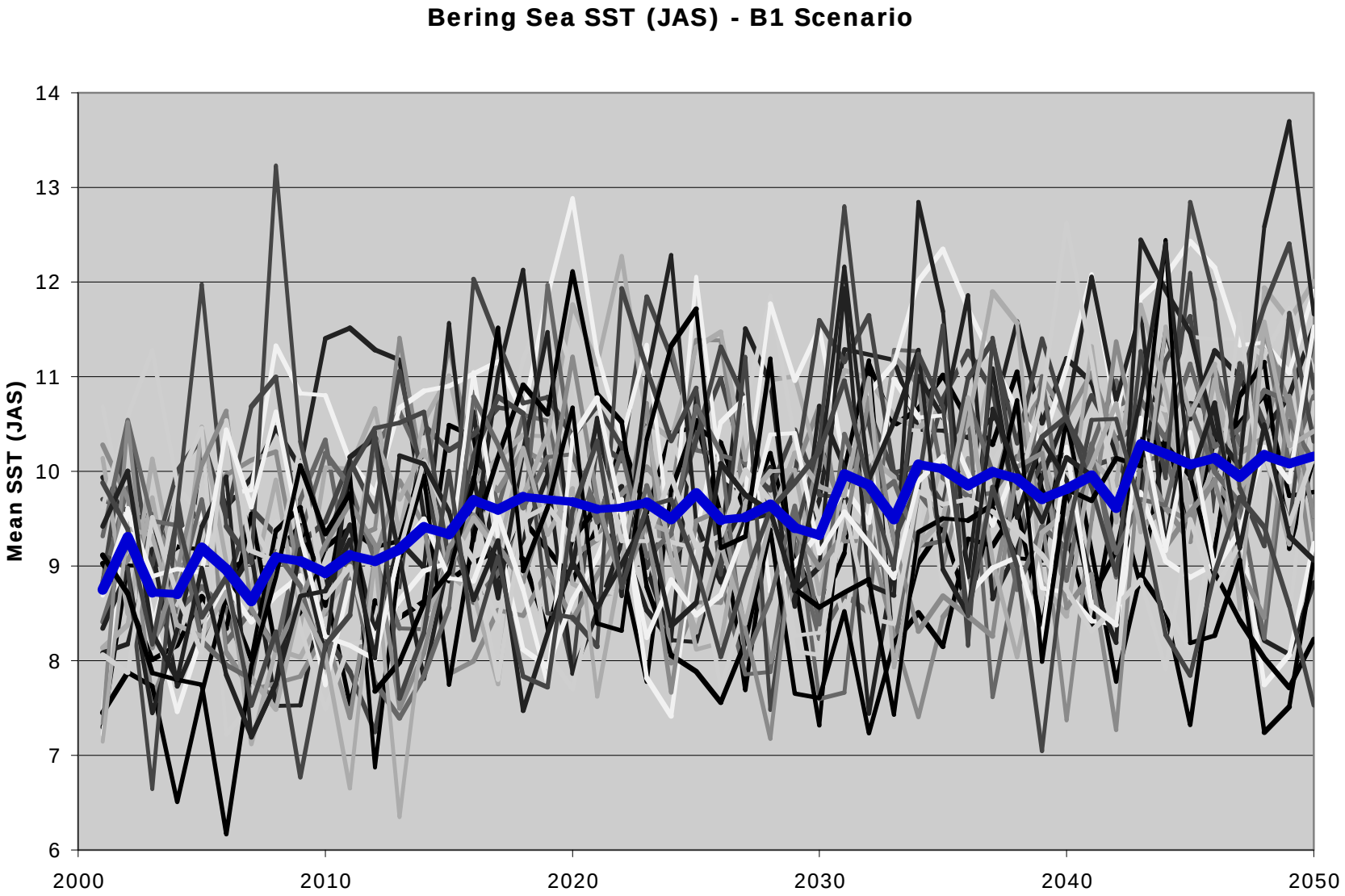
Procedural Issues

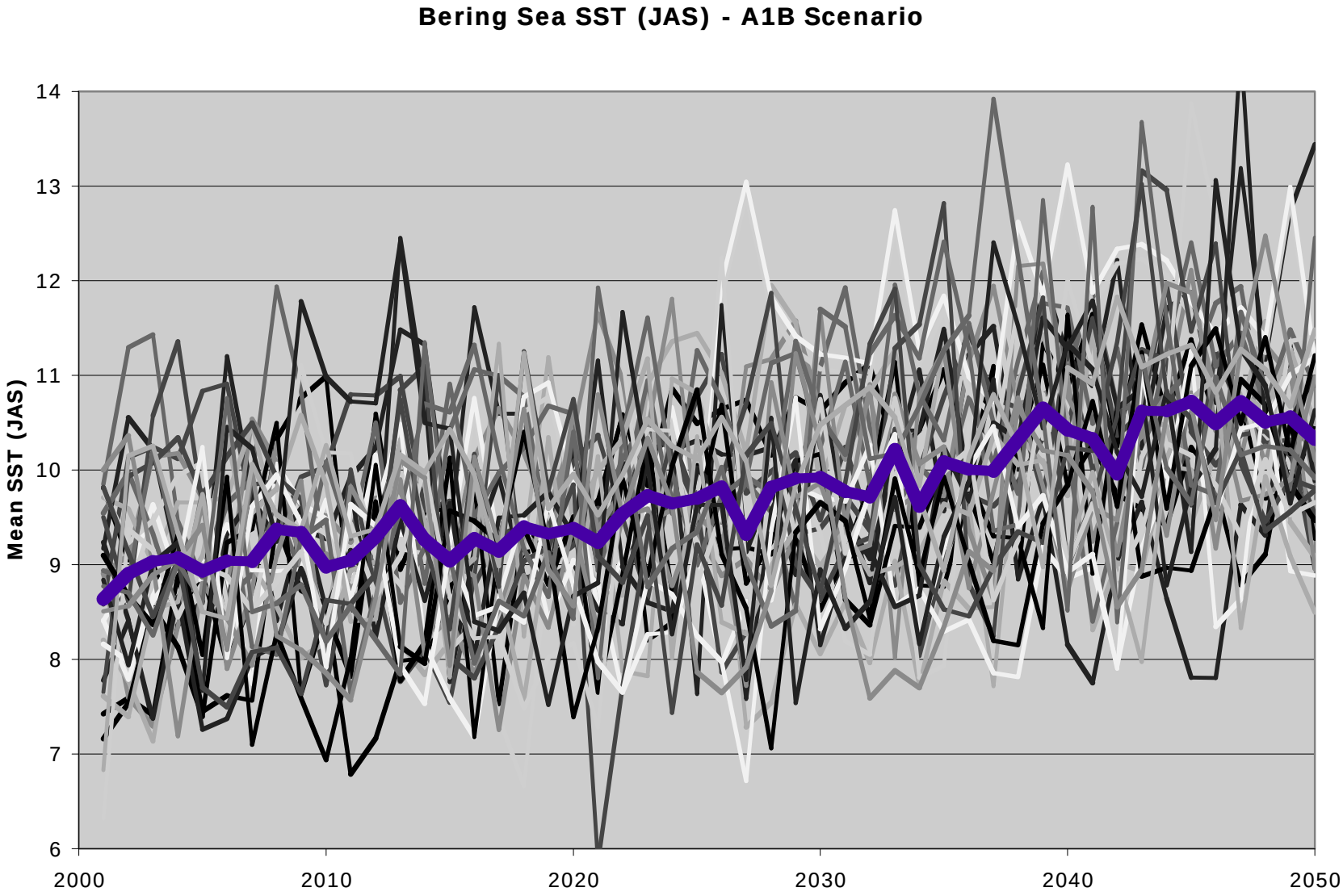
- Multi-model ensembles
- Model selection and weighting
- Bias correction
- Use of empirical relationships
- Combining sources of error

BSIERP Integrated modeling

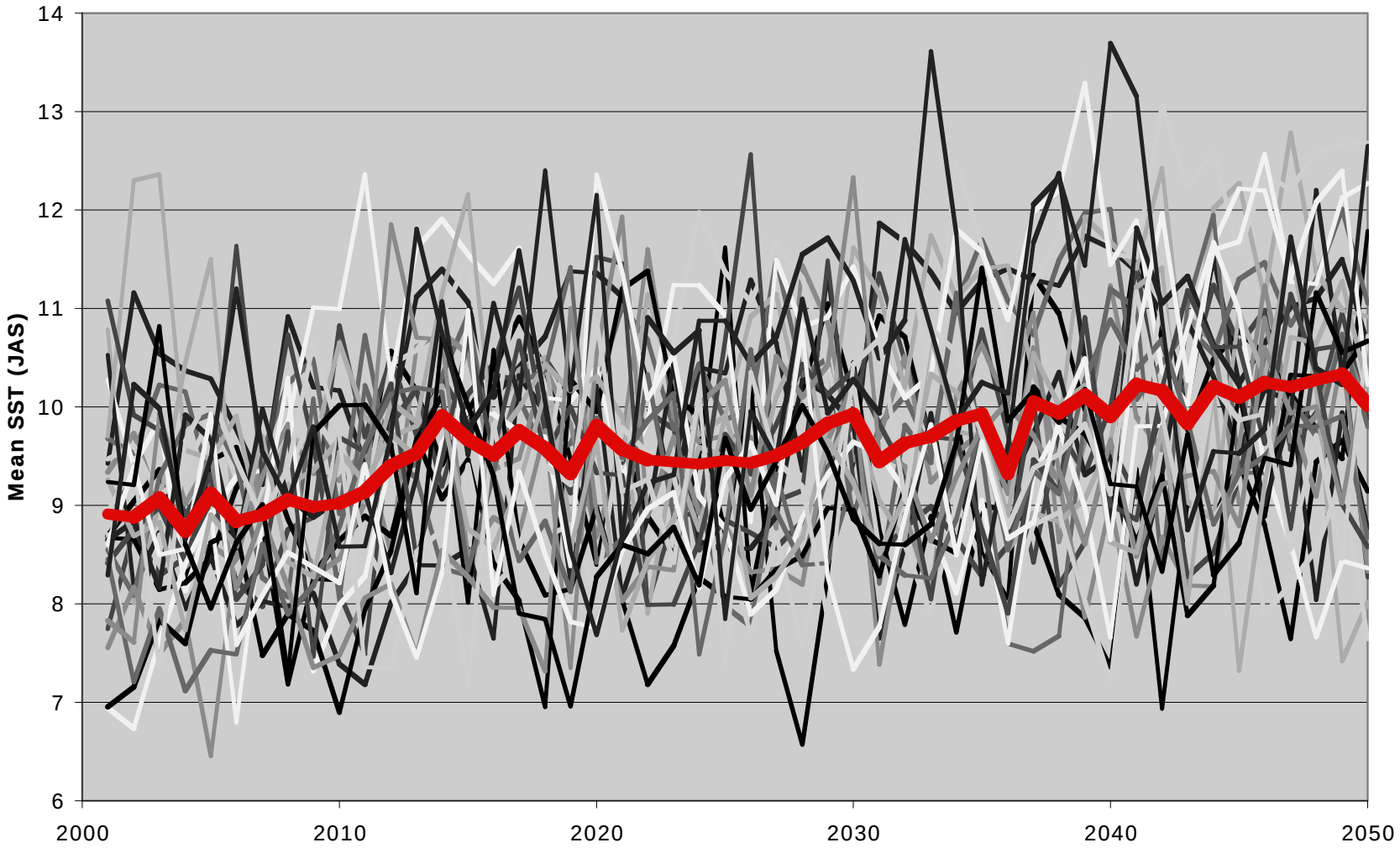



Spring conditions
(Late) summer conditions
Timing of ice retreat
Spring SST
Summer SST
Stability
Wind mixing
Prey
Prey
Spawning
Early larvae (spring)
Late larvae (fall)
Age-1 recruits
Predation
Biomass
Consumption rate
Prey composition
Spatial distribution

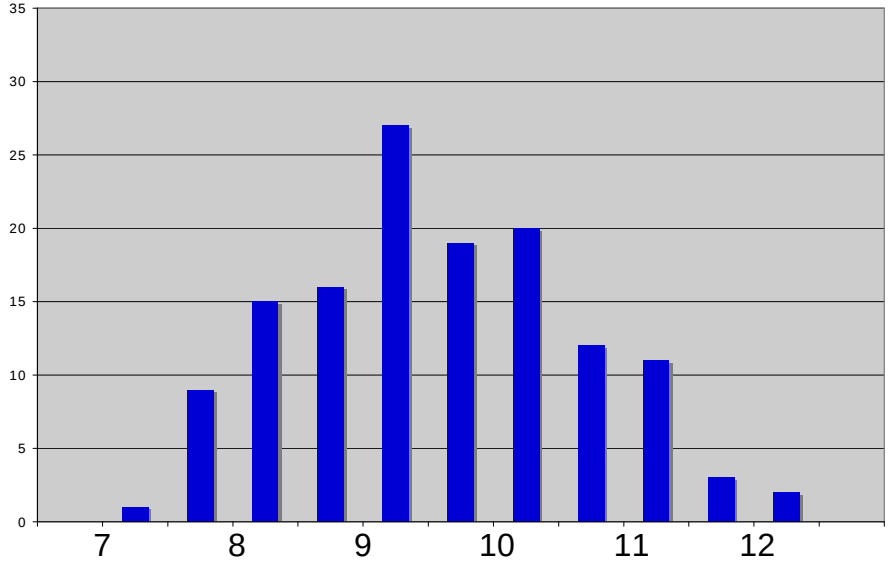

Bering Sea SST (JAS) - B1 Scenario
Mean SST (JAS)
14
13
12
11
10
9
8
7
6
2000
2010
2020
2030
2040
2050


Bering Sea SST (JAS) - A1B Scenario
Mean SST (JAS)
14
13
12
11
10
9
8
7
6
2000
2010
2020
2030
2040
2050

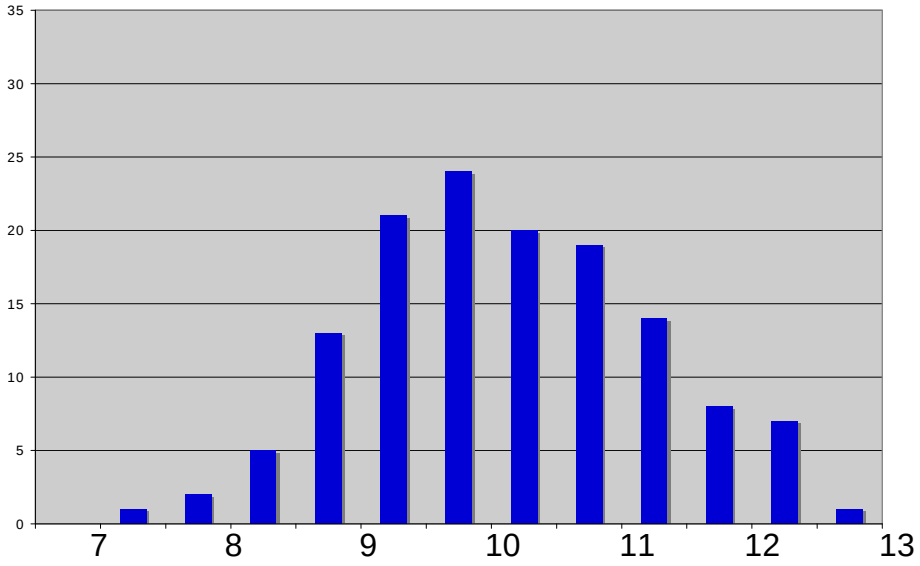
Bering Sea SST (JAS) - A2 Scenario



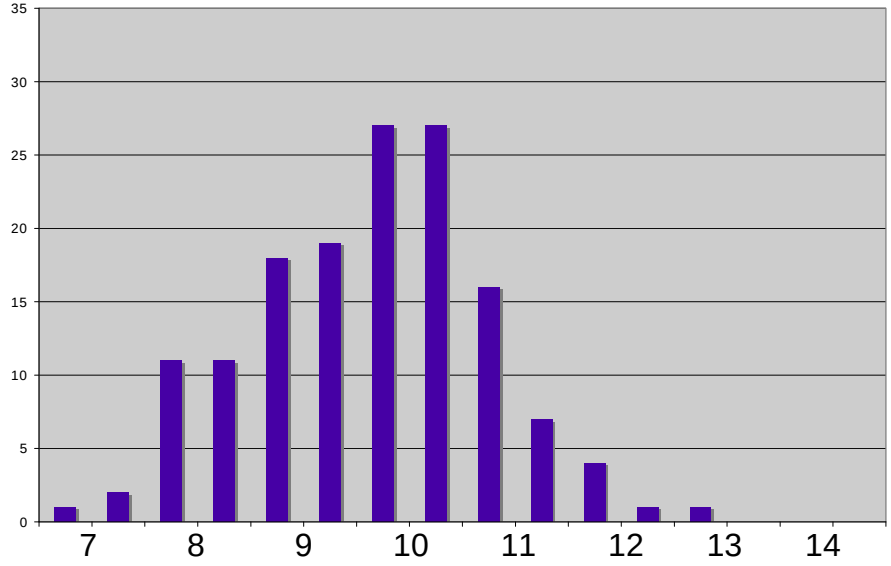
B1 Projected SST Anomalies (2023-2027)



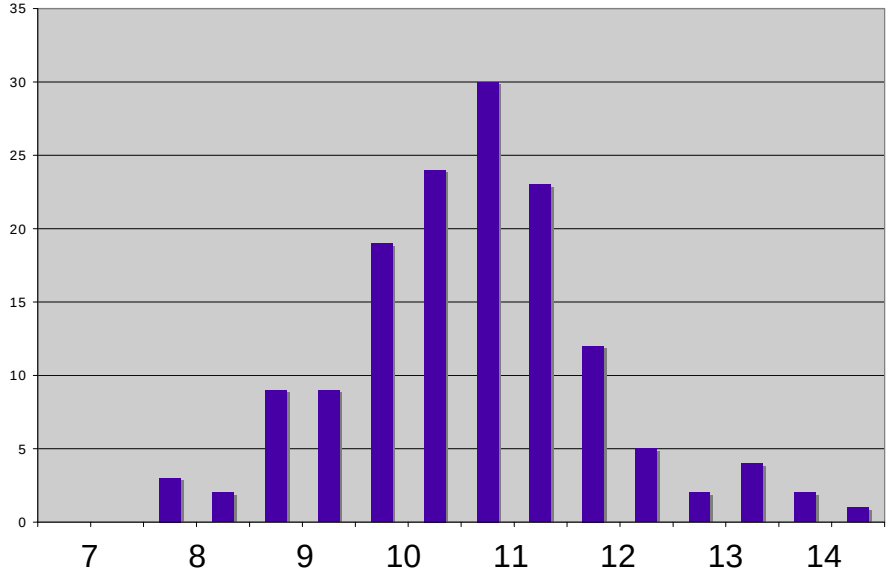
B1 Projected SST Anomalies (2043-2047)



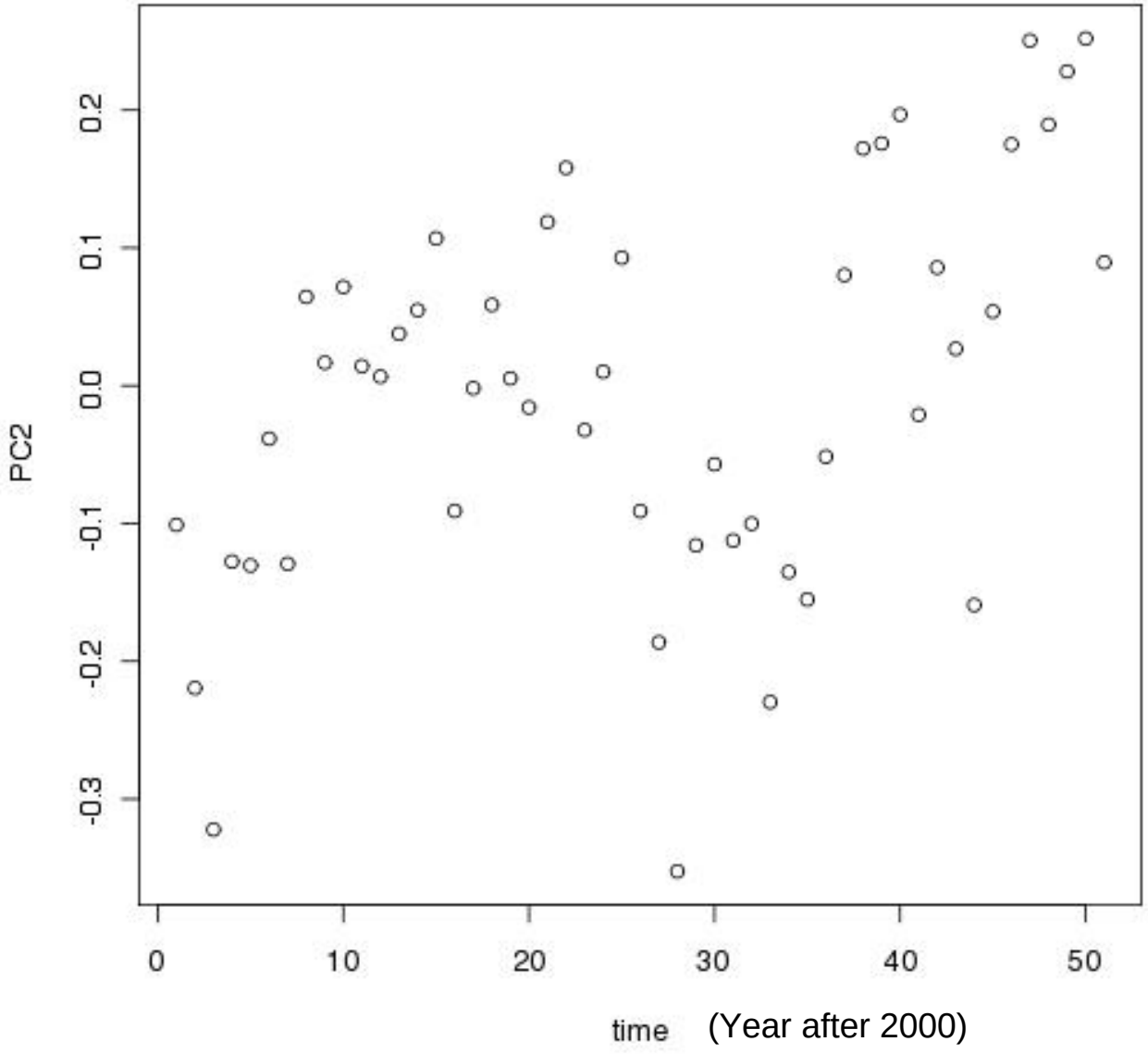
A1B Projected SST Anomalies (2023-2027)



A1B Projected SST Anomalies (2043-2047)



Principal Component Analysis of Time Series of Summer SST from IPCC Models



Modeling Oceanic Conditions on the Bering Sea shelf

Summer

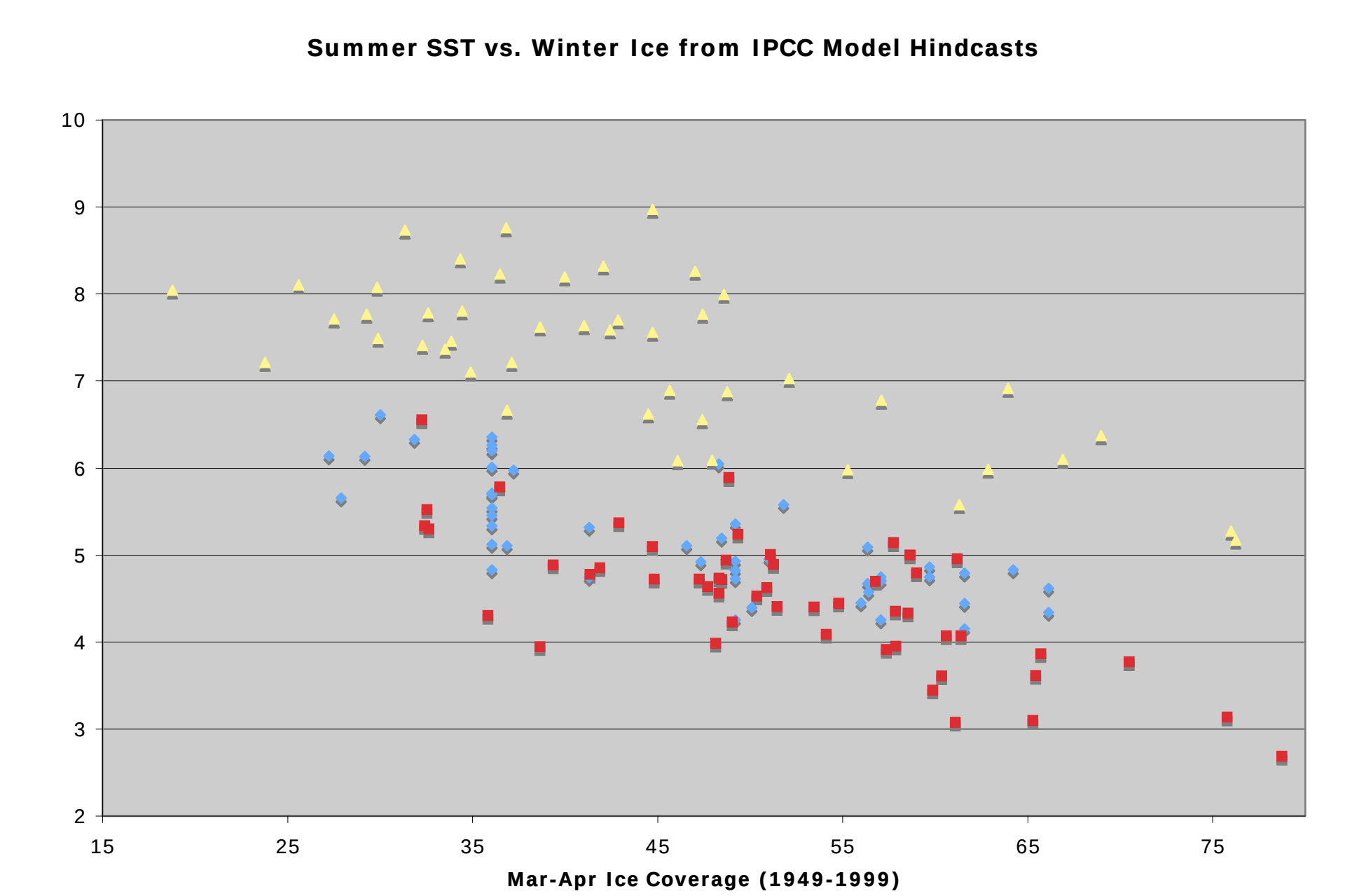
SST and Stratification

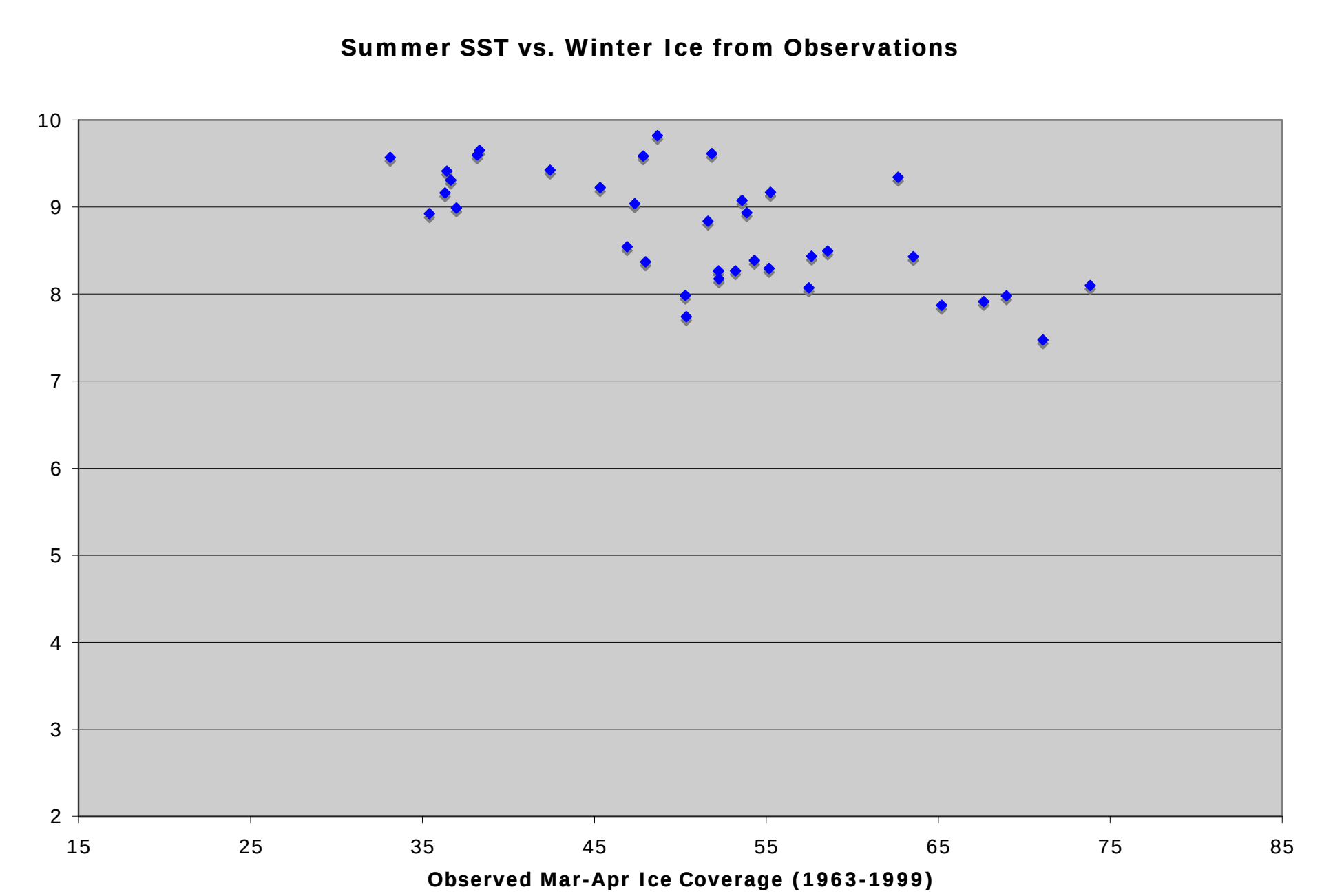
- Sensitive to small-scale, processes such as turbulence and cloud microphysics
- Difficult to model properly

Winter

Ice Cover

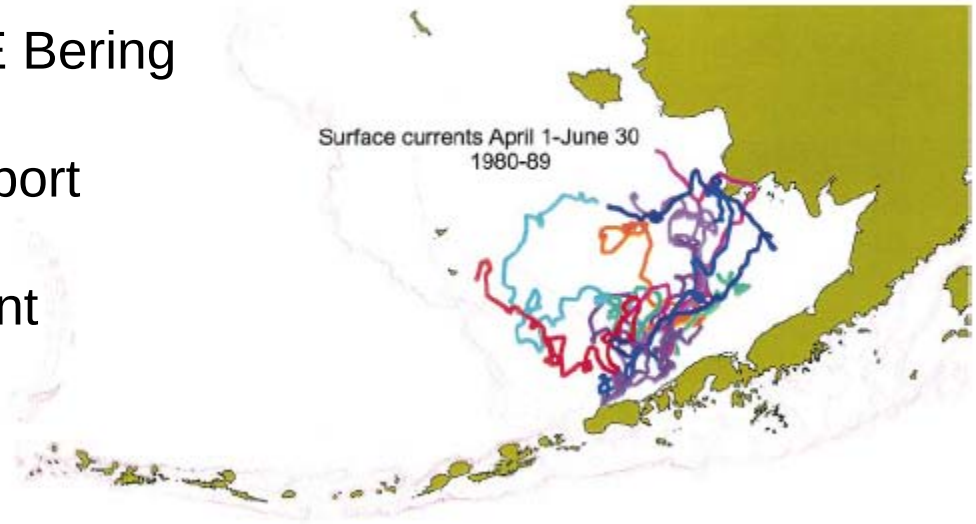
- Closely related to large-scale dynamics and radiative forcing
- More tractable to model

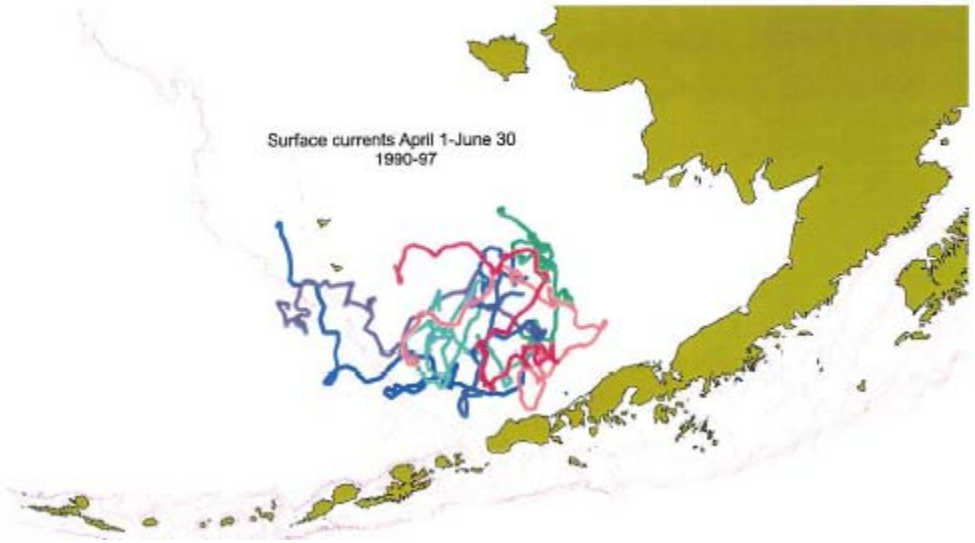

Summer SST vs. Winter Ice from IPCC Model Hindcasts
10
9
8
7
6
5
4
3
2
15
25
35
45
55
65
75
Mar-Apr Ice Coverage (1949-1999)

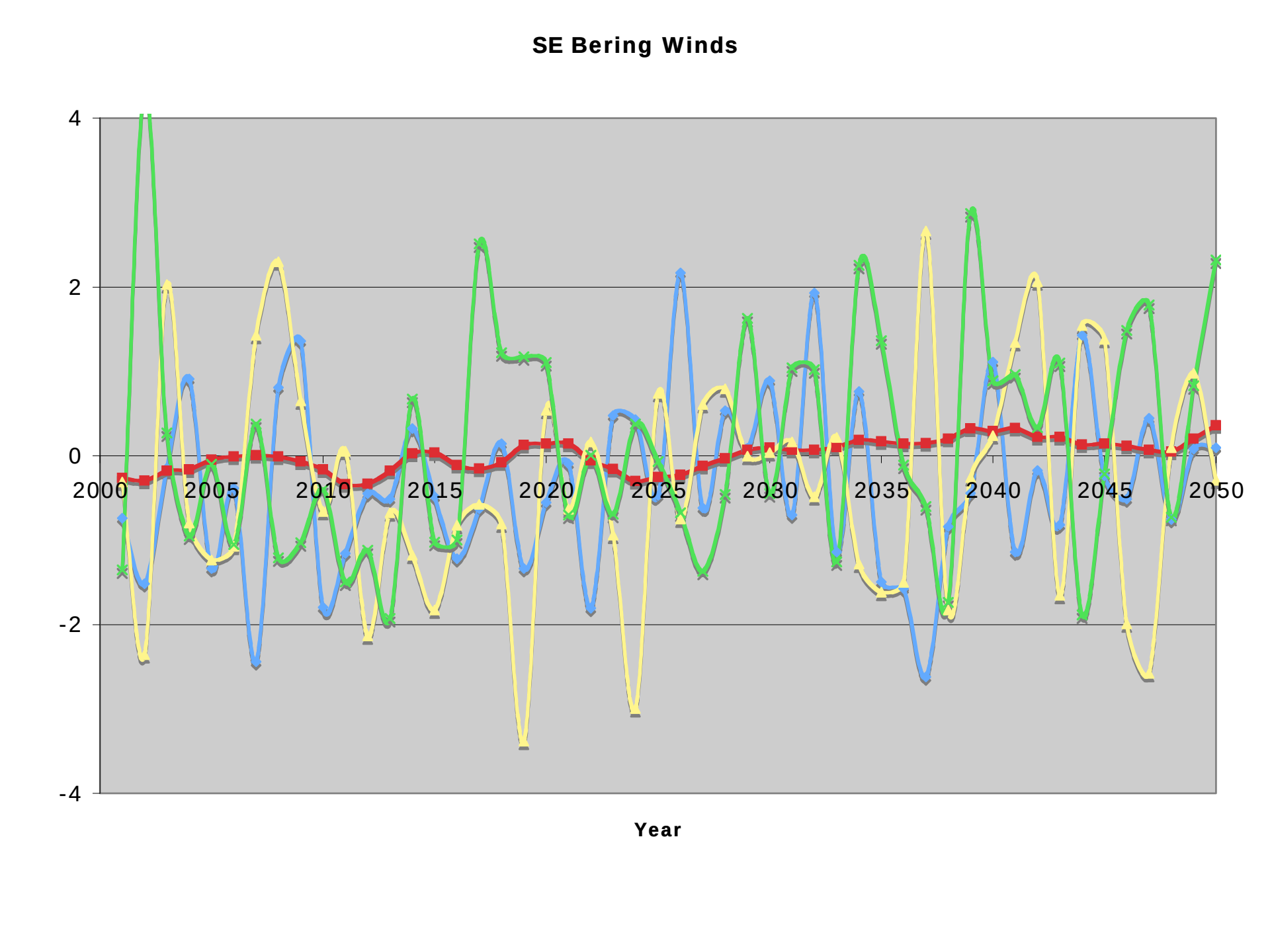

Summer SST vs. Winter Ice from Observations
10
9
8
7
6
5
4
3
2
15
25
35
45
55
65
75
85
Observed Mar-Apr Ice Coverage (1963-1999)

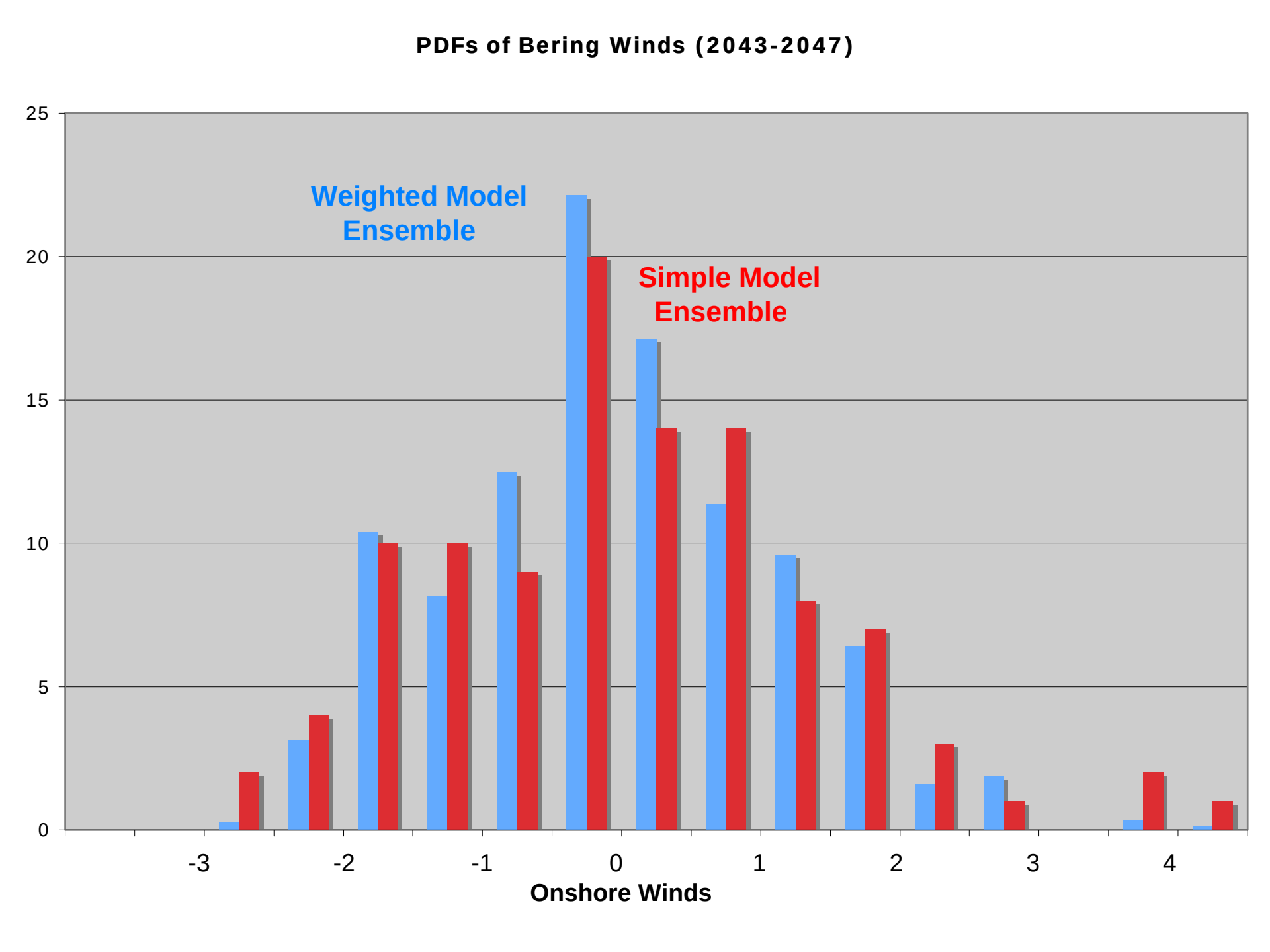
Flatfish in the SE Bering

Larval Transport & Recruitment






SE Bering Winds
4
2
0
-2
-4
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year


PDFs of Bering Winds (2043-2047)
Weighted Model Ensemble
Simple Model Ensemble
25
20
15
10
5
0
-3
-2
-1
0
1
2
3
4
Onshore Winds

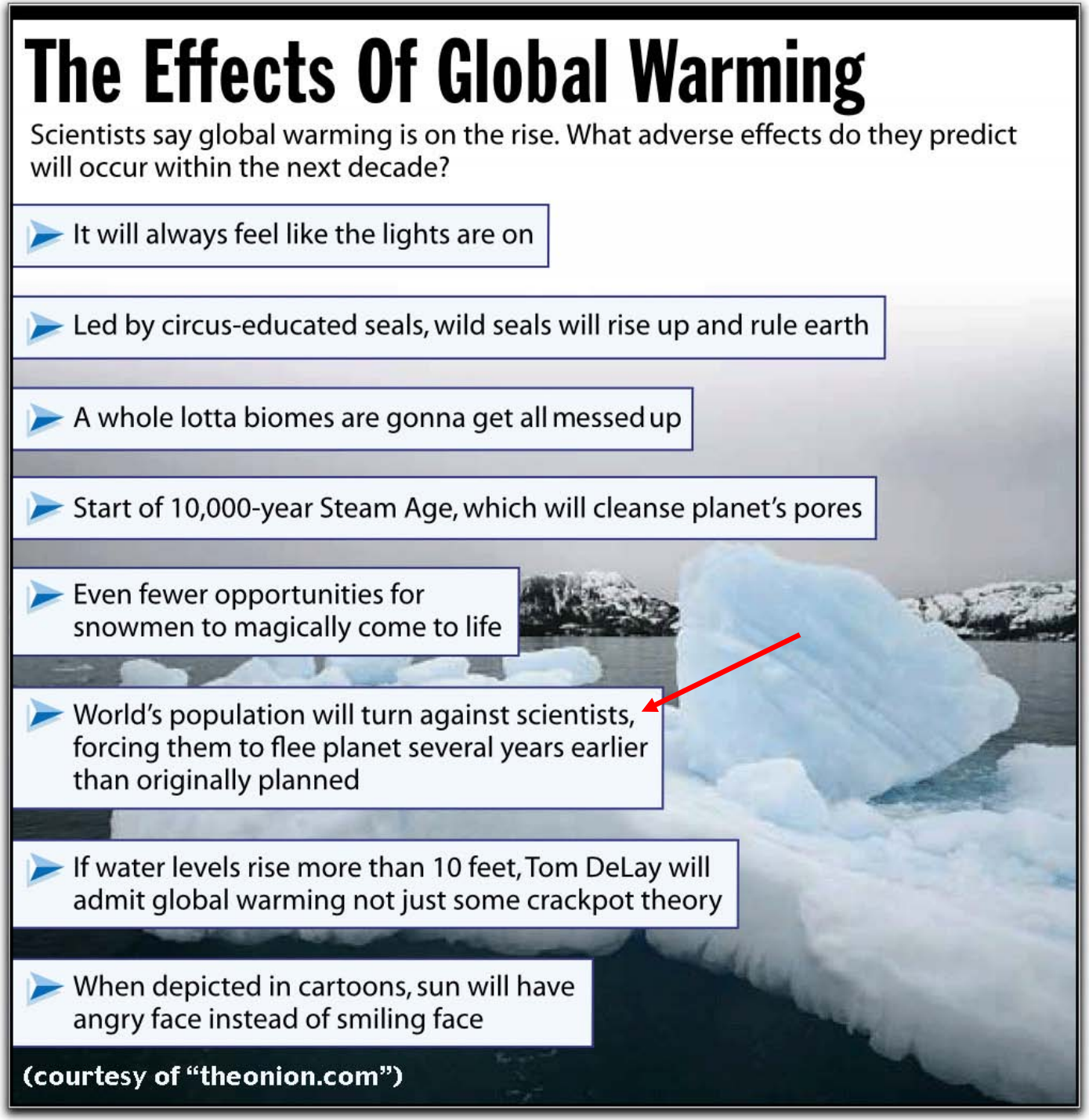
Final Remarks

- Trying to provide complete information on future climate pertaining to Bering Sea pollock
- Considering the various sources of uncertainty and error (global mean climate, regional trends and variability, crucial local parameters)
- Accounting for the multiple sources of uncertainty a complicated business
- Studying further the merits of using empirical techniques for projections of particular parameters, and evaluating and weighting individual model simulations
- Goal: Projections for MSE and other purposes

The Effects Of Global Warming

Scientists say global warming is on the rise. What adverse effects do they predict will occur within the next decade?

- It will always feel like the lights are on
- Led by circus-educated seals, wild seals will rise up and rule earth
- A whole lotta biomes are gonna get all messed up
- Start of 10,000-year Steam Age, which will cleanse planet's pores
- Even fewer opportunities for snowmen to magically come to life
- World's population will turn against scientists, forcing them to flee planet several years earlier than originally planned
- If water levels rise more than 10 feet, Tom DeLay will admit global warming not just some crackpot theory
- When depicted in cartoons, sun will have angry face instead of smiling face



(courtesy of "theonion.com")