Climate Change Facts: Should Oklahoma Be Concerned?

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Oklahoma Water Resources Board

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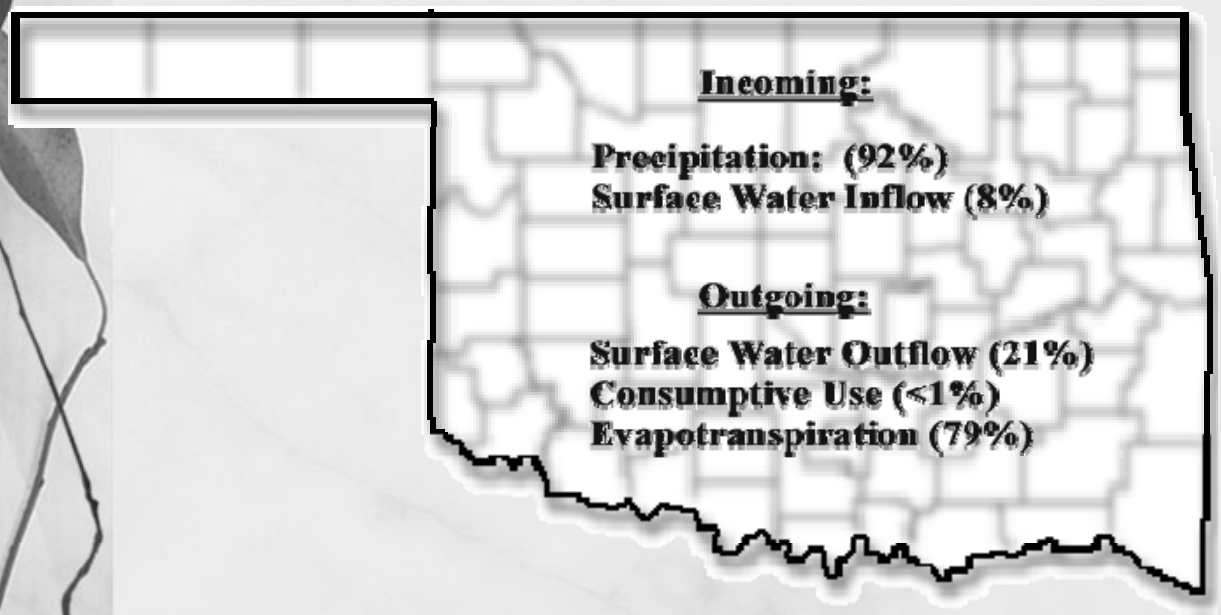
“The provision of adequate fresh water resources and ecosystems will be one of the most critical and potentially contentious issues facing society and governments at all levels during the 21st century.” – AMS Statement on Water Resources in the 21st Century

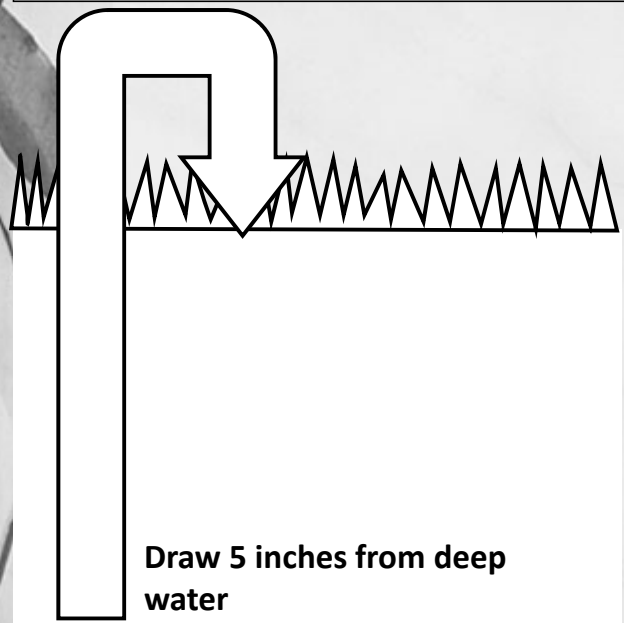
Oklahoma's water supply has been controlled by the NATURAL VARIABILITY of the climate system

Oklahoma's Hydrologic Cycle

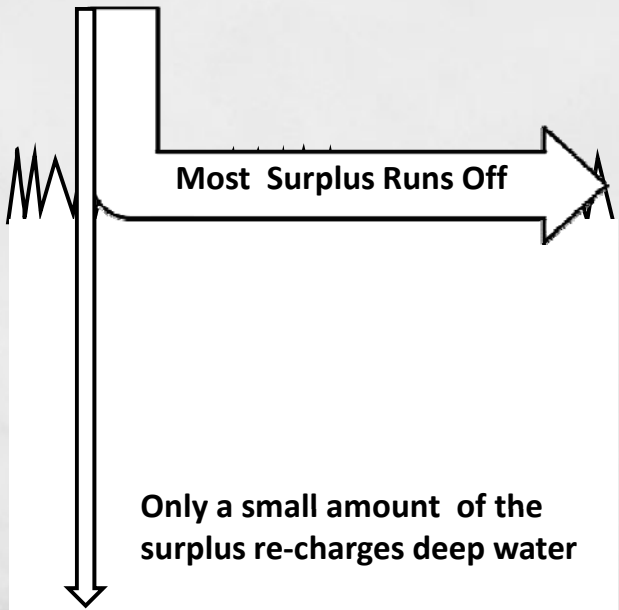


We Plan For ‘Normal’ Seasons…But…

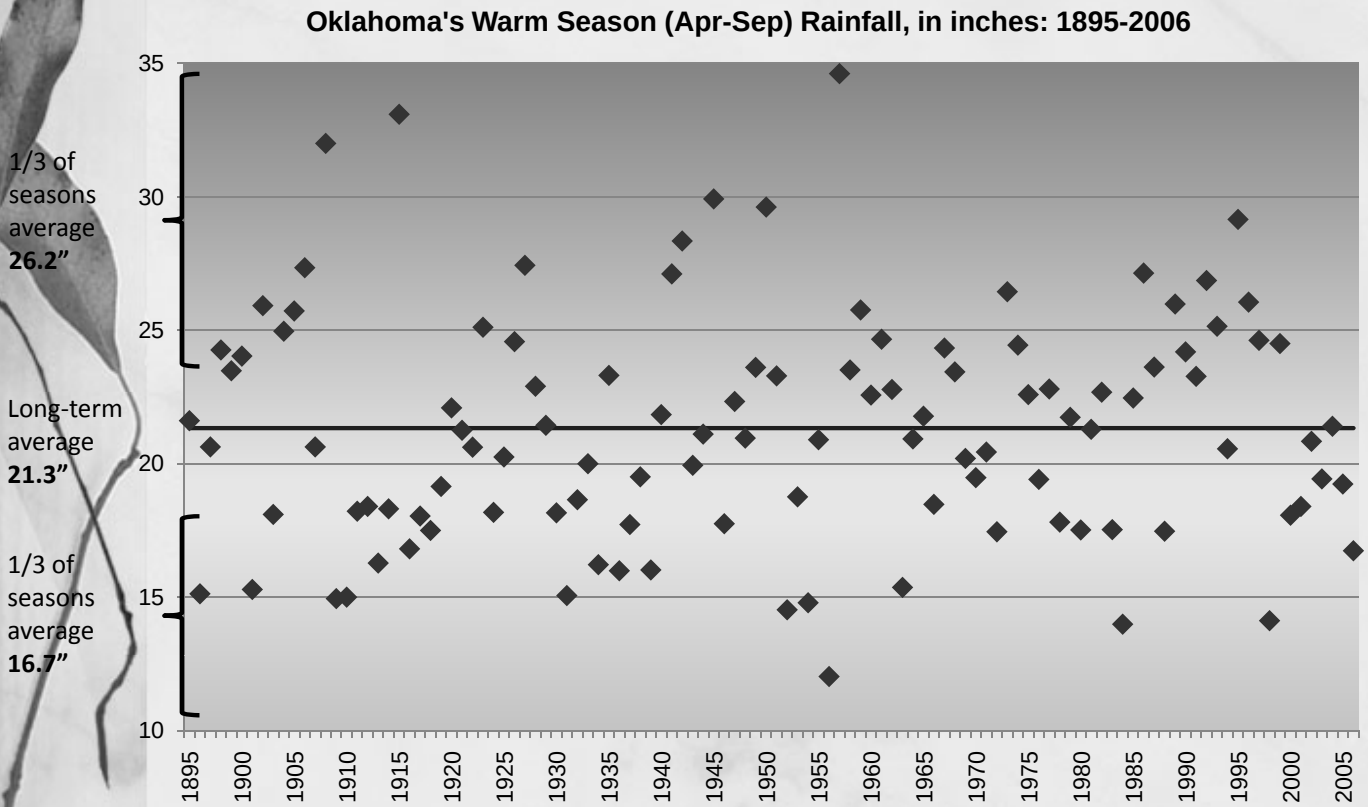
In a typical ‘dry’ season
(5-inch deficit)

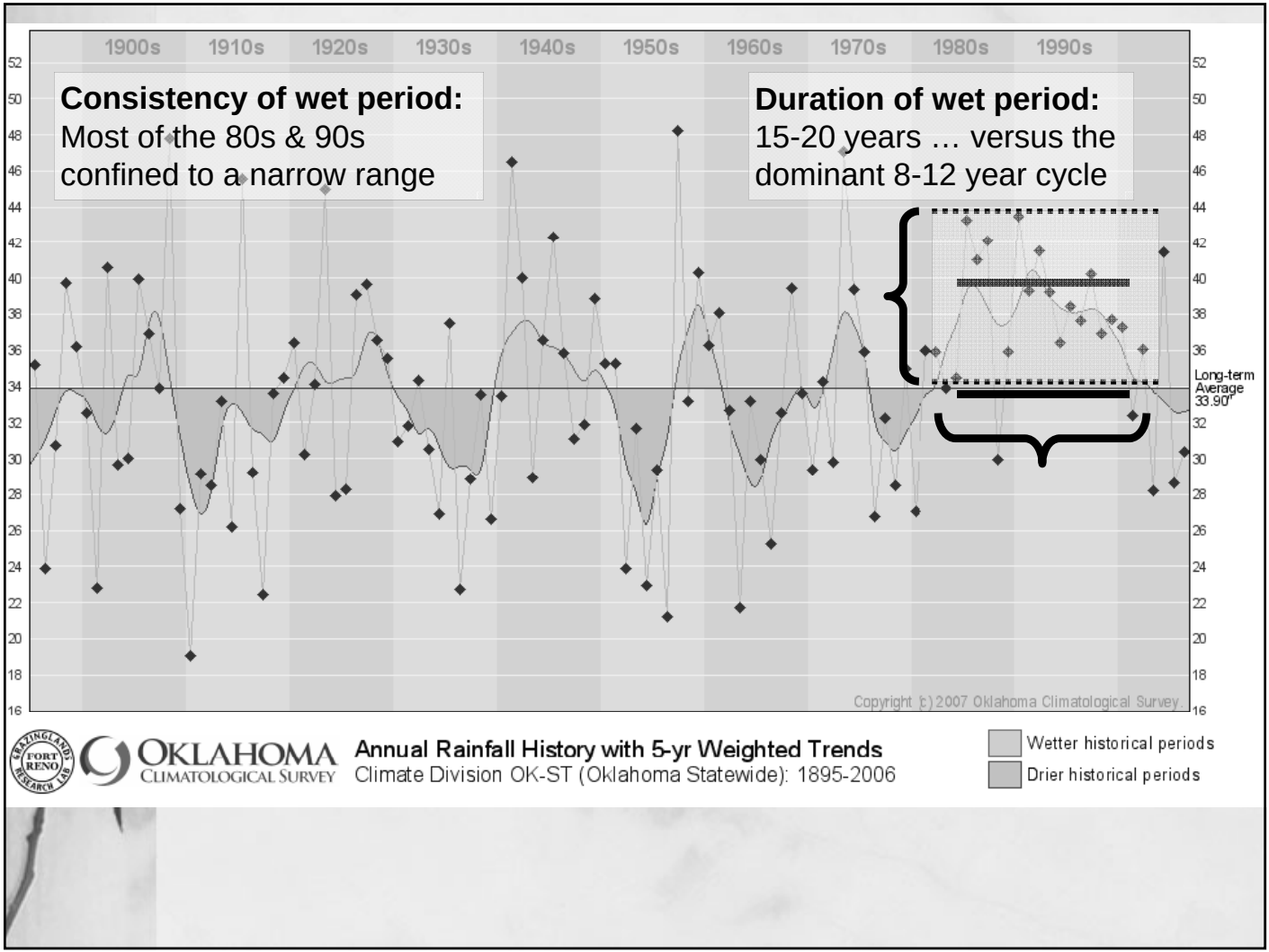


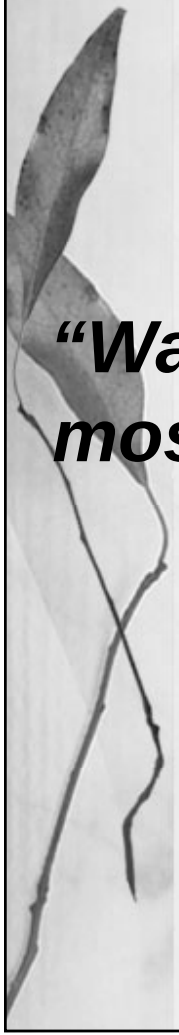
In a typical ‘wet’ season
(5-inch surplus)



There's nothing normal about "normal"!




1900s
1910s
1920s
1930s
1940s
1950s
1960s
1970s
1980s
1990s
Consistency of wet period:
Most of the 80s & 90s confined to a narrow range
Duration of wet period:
15-20 years … versus the dominant 8-12 year cycle
Long-term Average 33.90"
Copyright (c) 2007 Oklahoma Climatological Survey
OKLAHOMA CLIMATOLOGICAL SURVEY
Annual Rainfall History with 5-yr Weighted Trends
Climate Division OK-ST (Oklahoma Statewide): 1895-2006
Wetter historical periods
Drier historical periods

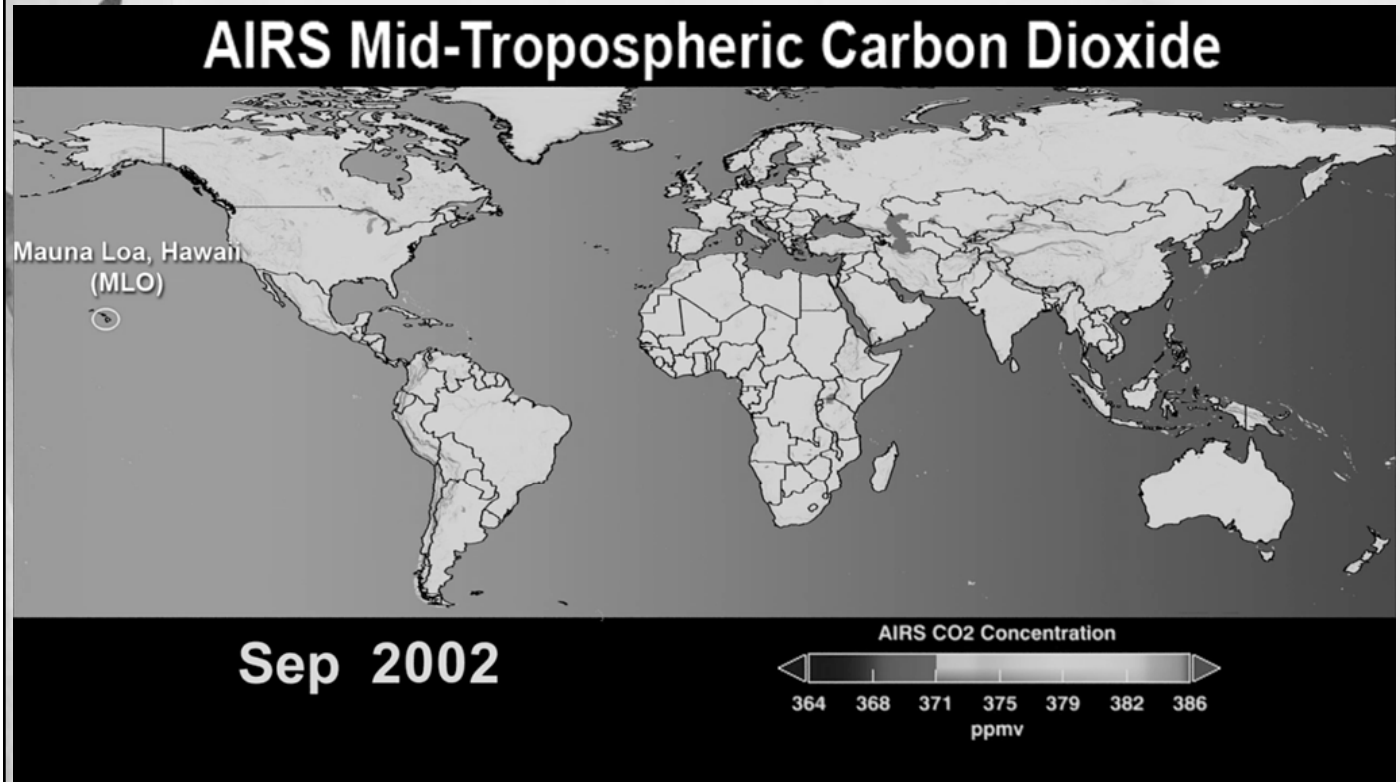


“Water is the delivery mechanism of most climate change impacts”

Kathy Jacobs
Executive Director
Arizona Water Institute

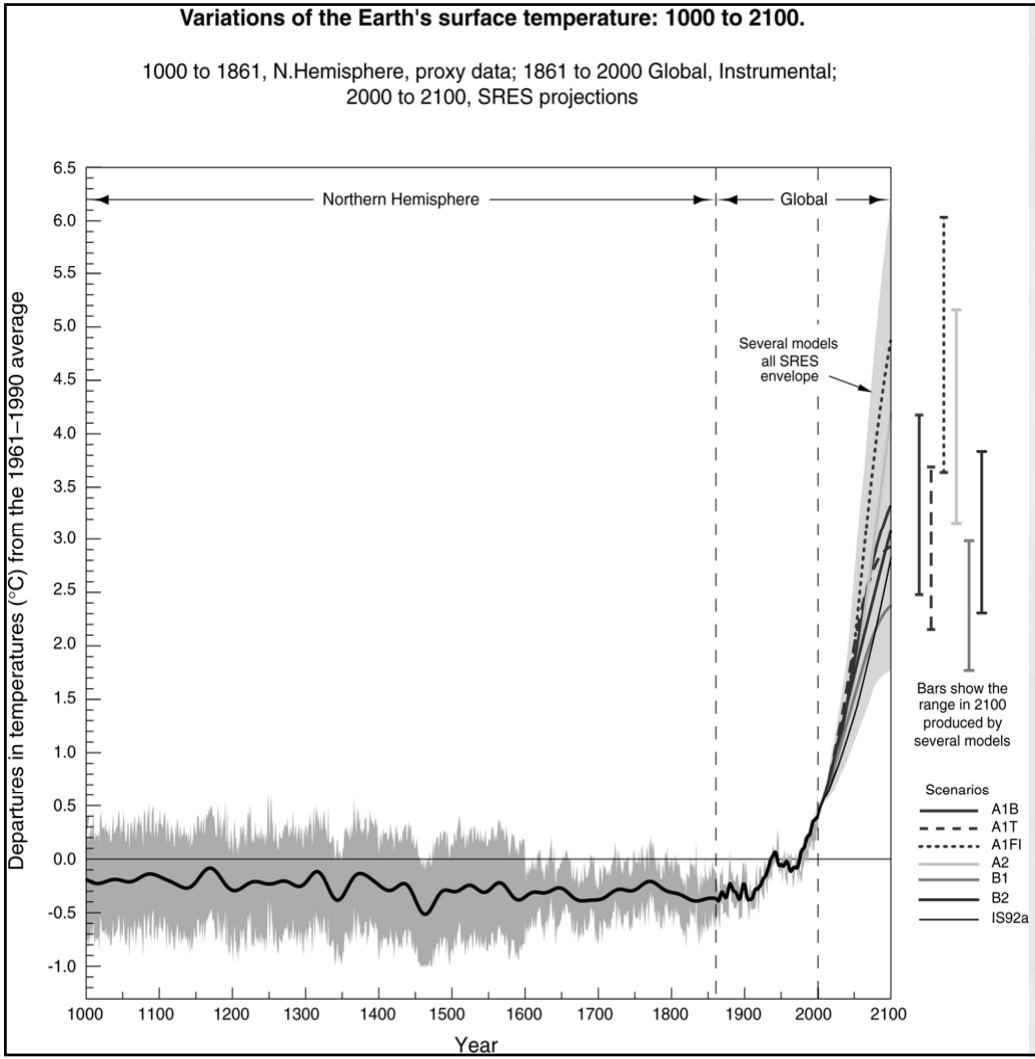
A Changing Climate

Climate Change?
YES!
Get Ready!
Don’t Panic!



(NASA Animation, release Oct 7, 2008)

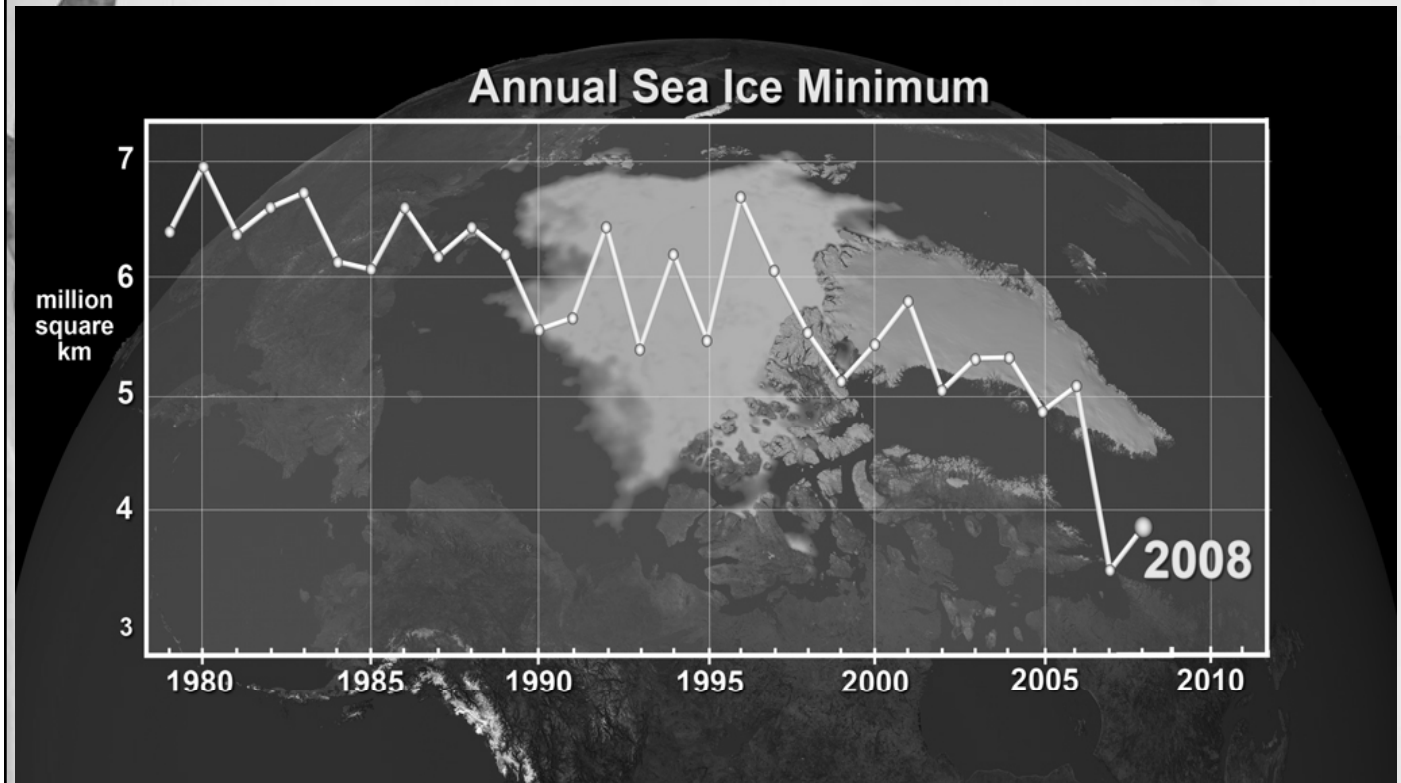
Climate Change?
CO_2 tells us -
YES!

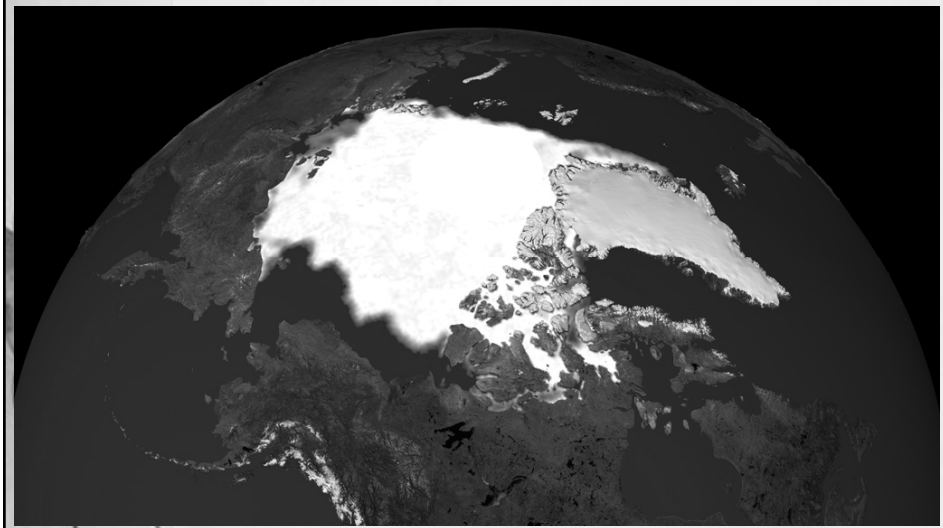


"The projected rate of warming is much larger than observed changes during the 20th century and is very likely to be without precedent during at least the last 10,000 years."

Dr. David Karoly, OU

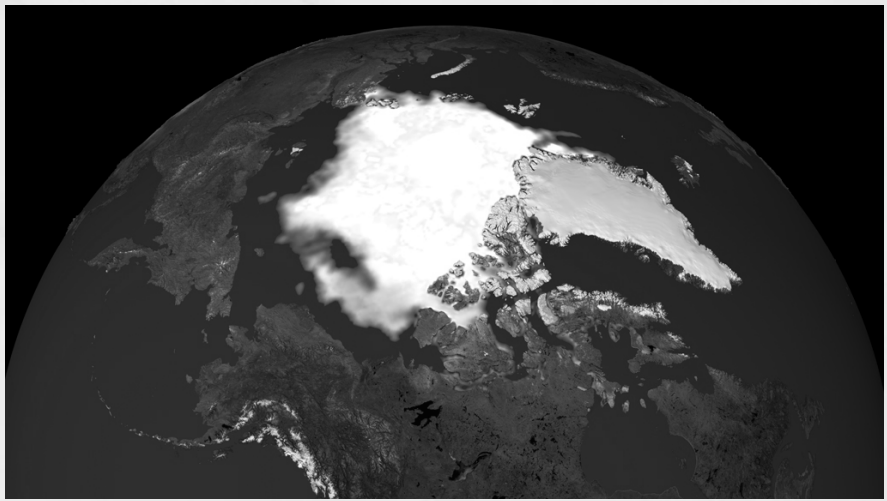
Climate Change?
Scientists tell us –
YES!


Annual Sea Ice Minimum
million square km
7
6
5
4
3
1980
1985
1990
1995
2000
2005
2010
2008



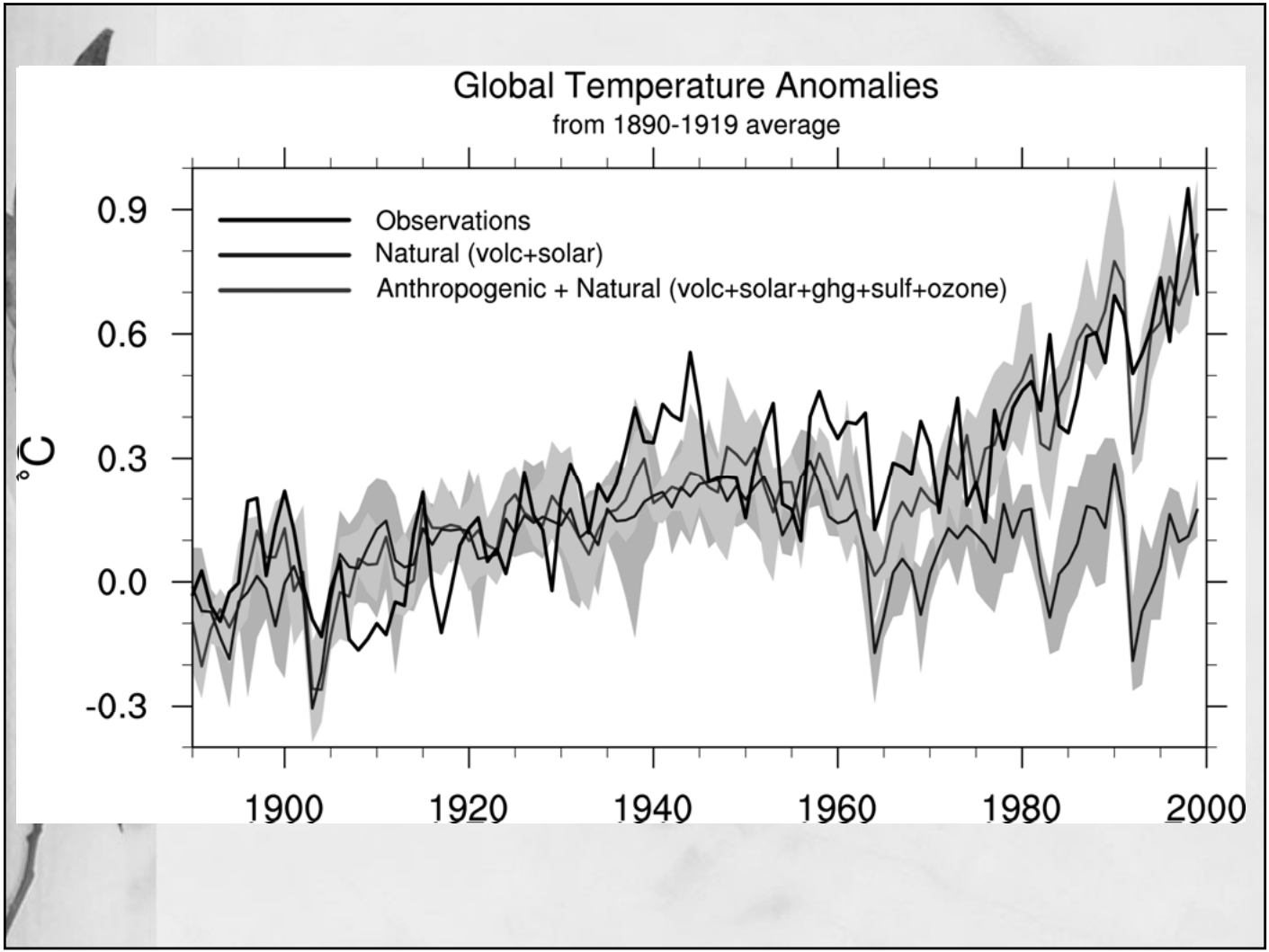
1979

2006



Climate Change?

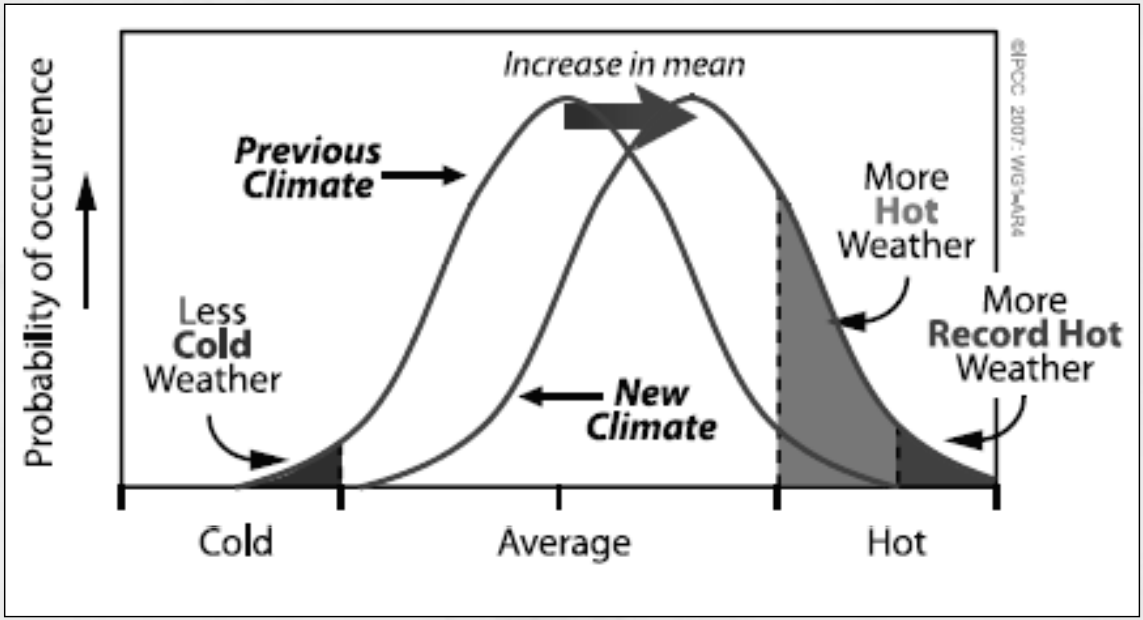
Ice tells us - YES!

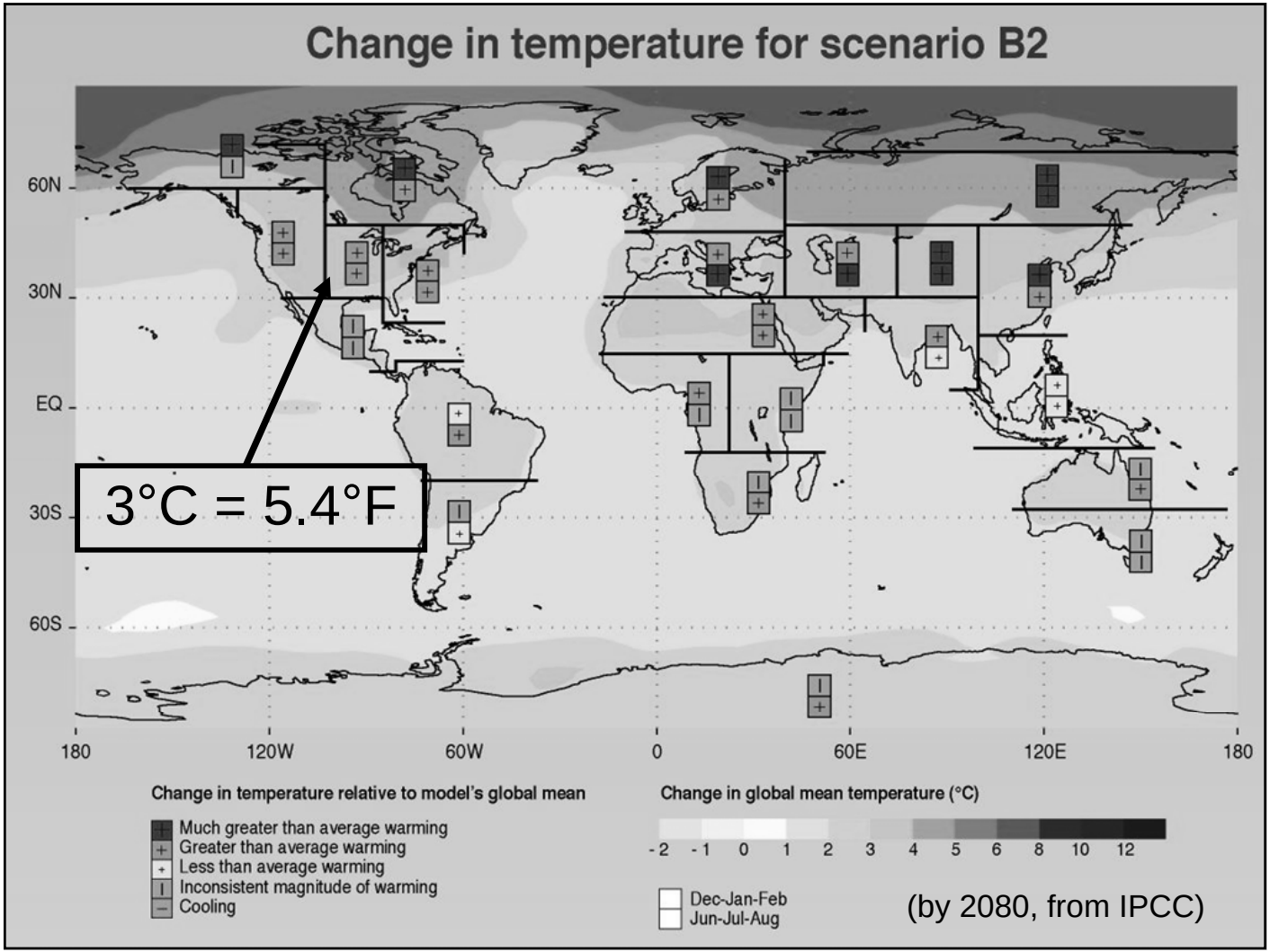

Global Temperature Anomalies
from 1890-1919 average
Observations
Natural (volc+solar)
Anthropogenic + Natural (volc+solar+ghg+sulf+ozone)
°C
0.9
0.6
0.3
0.0
-0.3
1900
1920
1940
1960
1980
2000

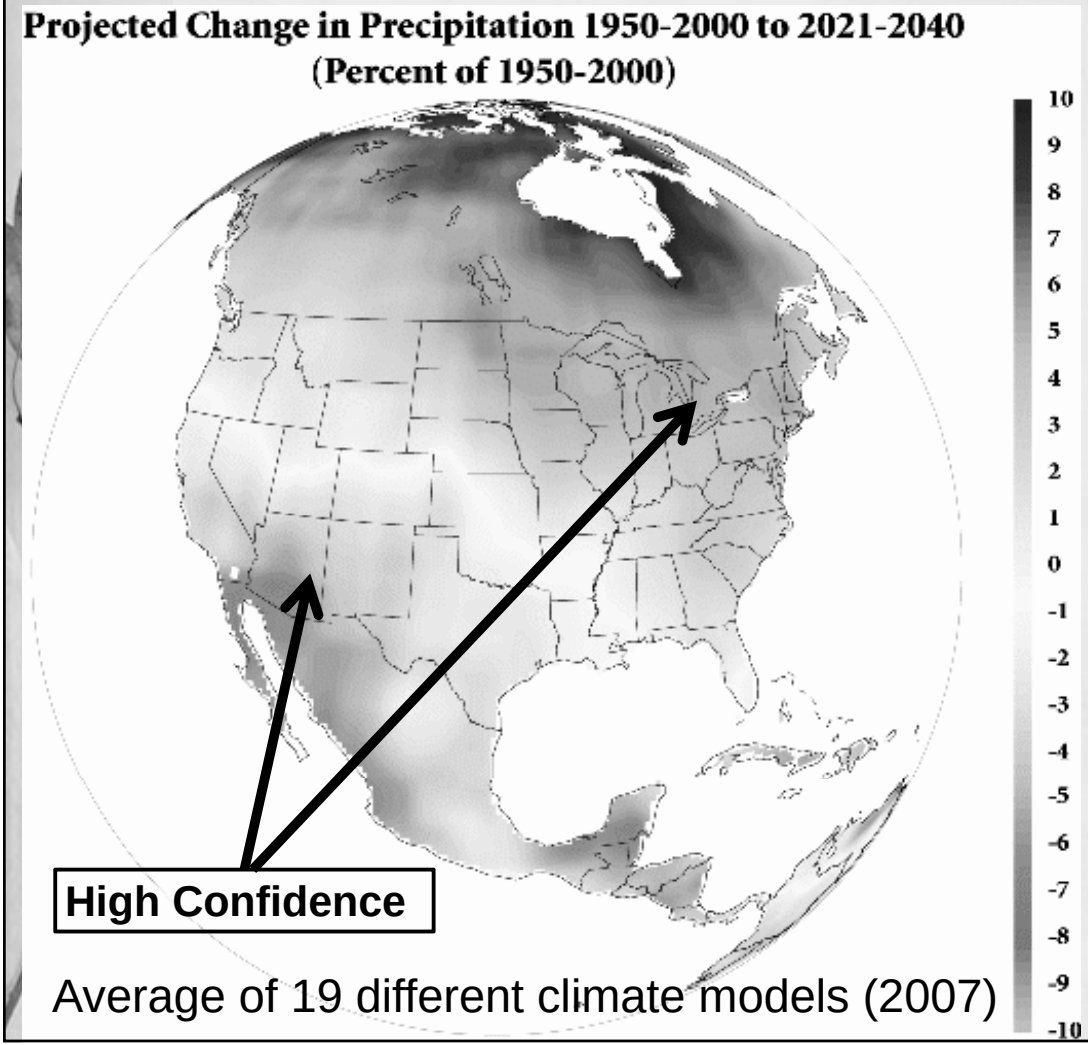
Change driver natural or human?
BOTH!

What can we expect?

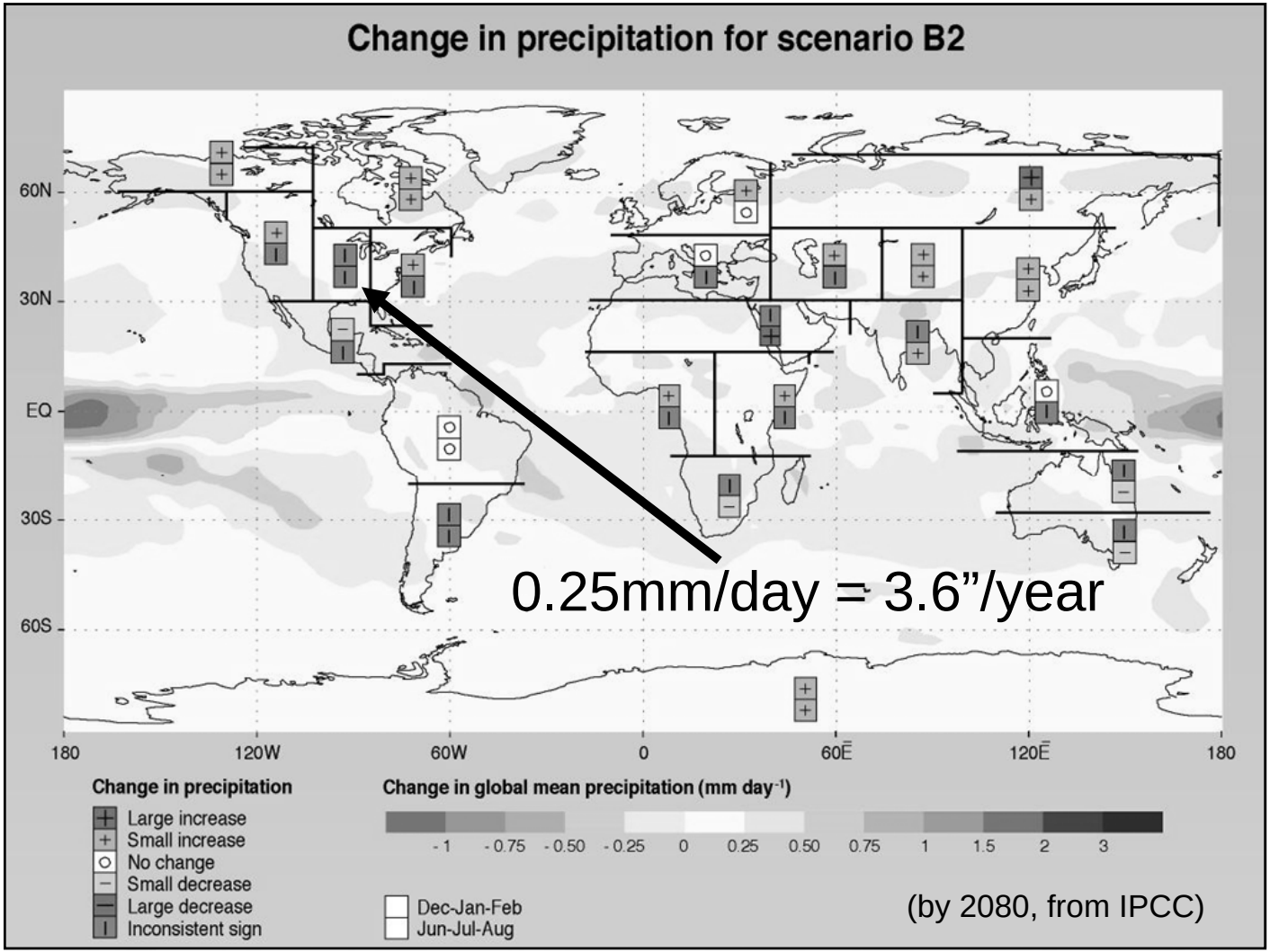
Extreme Temperatures Will Increase




Change in temperature for scenario B2
60N
30N
EQ
30S
60S
180
120W
60W
0
60E
120E
180
3°C = 5.4°F
Change in temperature relative to model's global mean
Much greater than average warming
Greater than average warming
Less than average warming
Inconsistent magnitude of warming
Cooling
Change in global mean temperature (°C)
-2 -1 0 1 2 3 4 5 6 8 10 12
Dec-Jan-Feb
Jun-Jul-Aug
(by 2080, from IPCC)



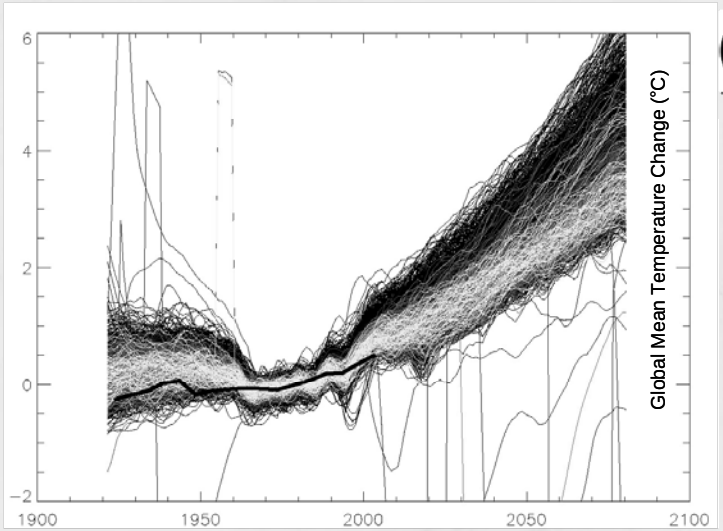
Annual precipitation across the USA will increase in the northeast and decrease in the southwest


Change in precipitation for scenario B2
60N
30N
EQ
30S
60S
180
120W
60W
0
60E
120E
180
0.25mm/day = 3.6”/year
Change in precipitation
Large increase
Small increase
No change
Small decrease
Large decrease
Inconsistent sign
Change in global mean precipitation (mm day-1)
-1
-0.75
-0.50
-0.25
0
0.25
0.50
0.75
1
1.5
2
3
Dec-Jan-Feb
Jun-Jul-Aug
(by 2080, from IPCC)

Climate Modeling — Where It Is Headed

- Estimating uncertainties in *global* and *regional* climate change projections using a large multi-member climate model ensemble

Initial Simulations From ClimatePrediction.net



climateprediction.net

CPDN Initial Simulations

Projections for Oklahoma as we scale down

Temperature

- Warming of ~2-4°F annually by the 2020s (Middle Road)
- Warming of ~4-7°F by the 2090s (Middle Road)
- Summer becomes longer and spring weather arrives earlier.
- Winters warm - longer frost-free periods and a longer growing season.

Precipitation

- Rain-free periods will increase, but individual rainfall events will be more intense
- Increased year-round evaporation from the ground and transpiration from green vegetation
- Drought frequency and severity increases

Oklahoma's Water Future?

Fewer (but more intense) precipitation events:

- More runoff, more flooding
- Crop damage
- More pollution from runoff
- Increased erosion
- Possibly less water available, even if yearly totals increase

The OCS Position on Water Resources & Climate Change

We Conclude The Following To Be True:

- The earth's climate has warmed during the last 100 years and will continue to warm for the foreseeable future.
- The citizens of Oklahoma, more and more, will come to depend upon and require adequate supplies of fresh water.
- Because our future lies in access to fresh water, we must exercise due diligence to protect our water resources.
- Whatever our future, water management plans developed for a warmer climate must measure and understand the water budget of Oklahoma and develop policies accordingly.

Preparation
management
better than
crisis management

Climate Change?
YES!
Get Ready!
Don’t Panic!

Thanks for Your Time!

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