

Global Warming Where's the Alarm?

John R. Christy

University of Alabama in Huntsville

Alabama State Climatologist

**[I] always wanted to be a
scientist ...**

**TierneyLab - Science, *NY Times*
John Tierney**

**[I] always wanted to be a
scientist ...**

**but went into journalism
because the peer review
process was a great deal
easier to sneak through**

TierneyLab - Science, *NY Times*

John Tierney

**When we don't know what you
are doing**

**When we don't know what you
are doing**

**We don't know what you are
doing wrong**

Consensus is not Science

Michael Crichton

Consensus is not Science

Michael Crichton

All Science is numbers

William Thomson (Lord Kelvin)

The Basics

- Carbon Dioxide is essential for all of life
 - “Plant Food” is its best definition
 - 16% increase in world-wide food production due to extra CO₂ emitted by human progress
- Climate is always “changing”
 - Global temperature is rising or falling
 - Sea level is rising or falling
 - Glaciers are retreating or advancing

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Testing Hypotheses on Global Warming

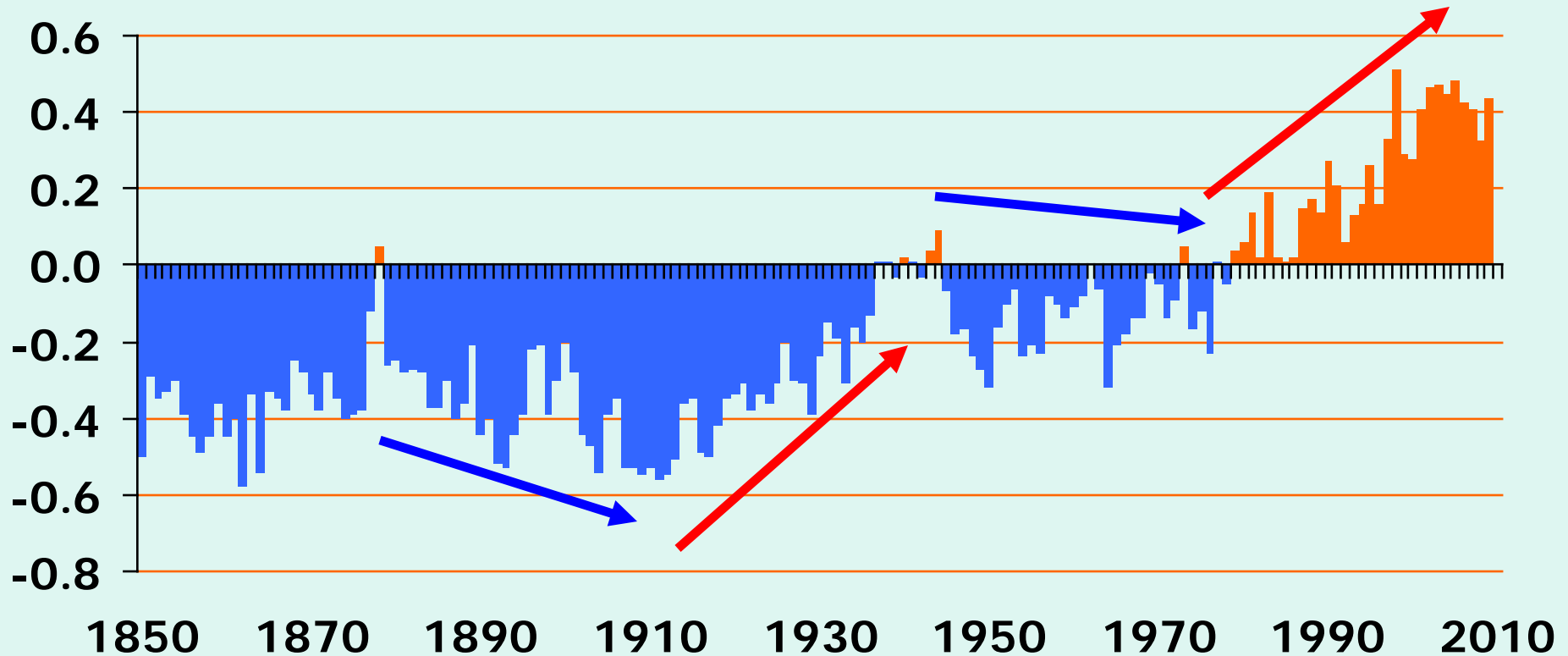
Testing Assertions based on Popular Surface Temperature Datasets

Popular datasets overstate the warming

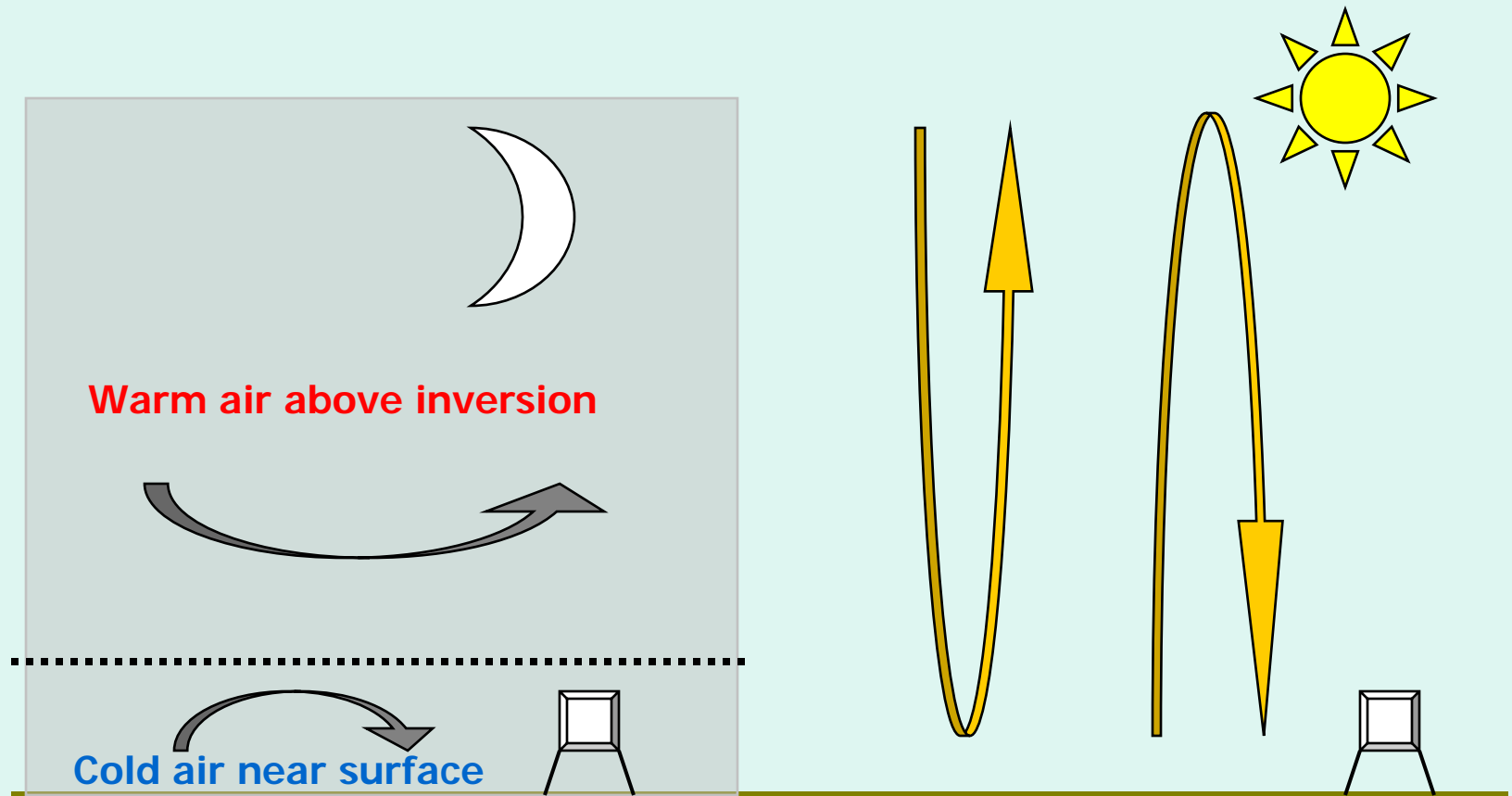
"Global" Surface Temperature

HadCRUT3

CO2 up 38% at current rate of 0.6% per year



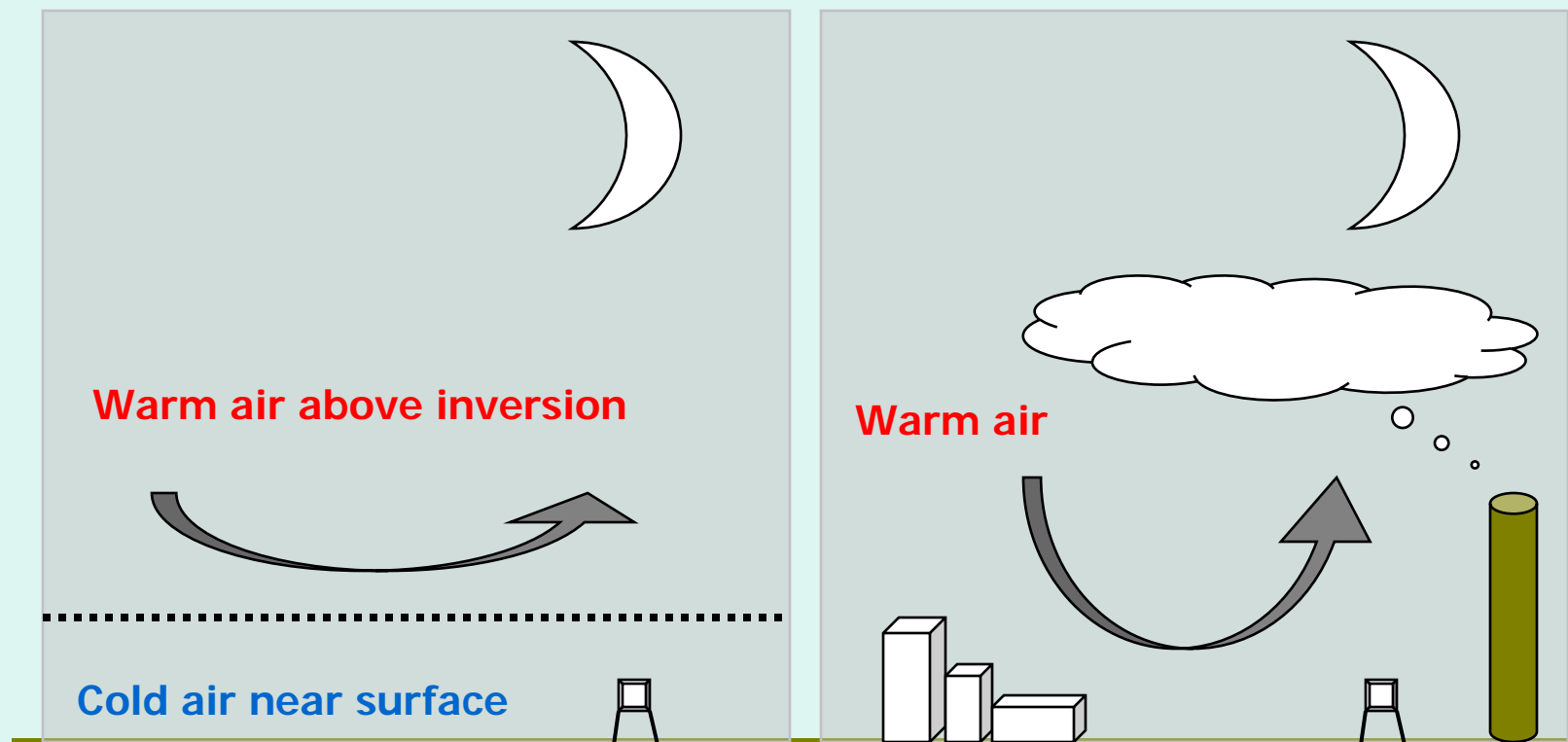
Day vs. Night Surface Temp



Nighttime - disconnected shallow layer/inversion. Temperature affected by land-use changes, buildings, farming, etc.

Daytime - deep layer mixing, connected with levels impacted by enhanced greenhouse effect

Night Surface Temp



Nighttime - disconnected shallow layer/inversion. But this situation can be sensitive to small changes such as roughness or heat sources.

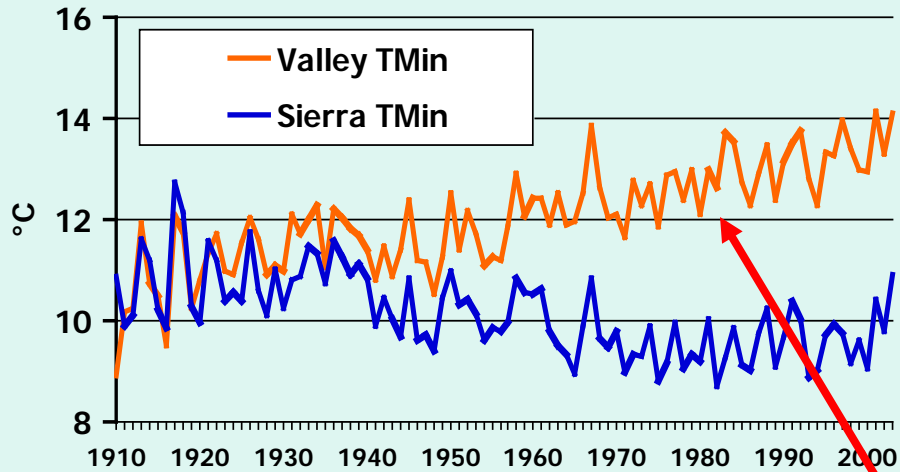
Buildings, heat releasing surfaces, aerosols, greenhouse gases, etc. can disrupt the delicate inversion, mixing warm air downward - affecting TMin.

A satellite image from the MODIS sensor showing a large fire in a mountainous region. The fire is visible as a bright white and yellow plume of smoke and ash rising from a forested area. The surrounding landscape is a mix of green and brown, indicating different vegetation types and possibly some fire damage. The image is oriented vertically, with the fire plume running from the bottom towards the top.

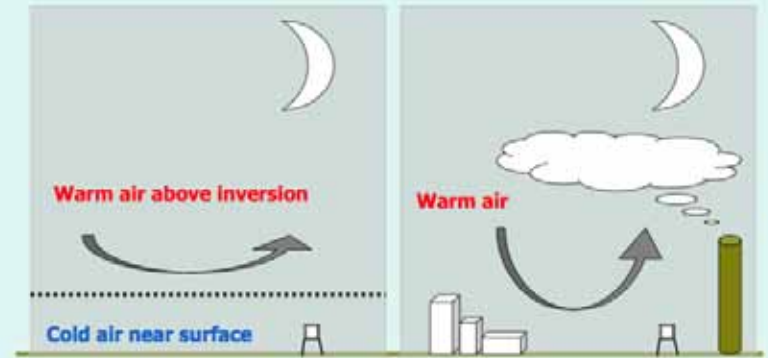
MODIS
21 Jul 2002

Jacques Descloitres
MODIS
Land Rapid Response Team
NASA GSFC

CA Valley and Sierra (Jun-Nov) 1910-2003



Night Surface Temp

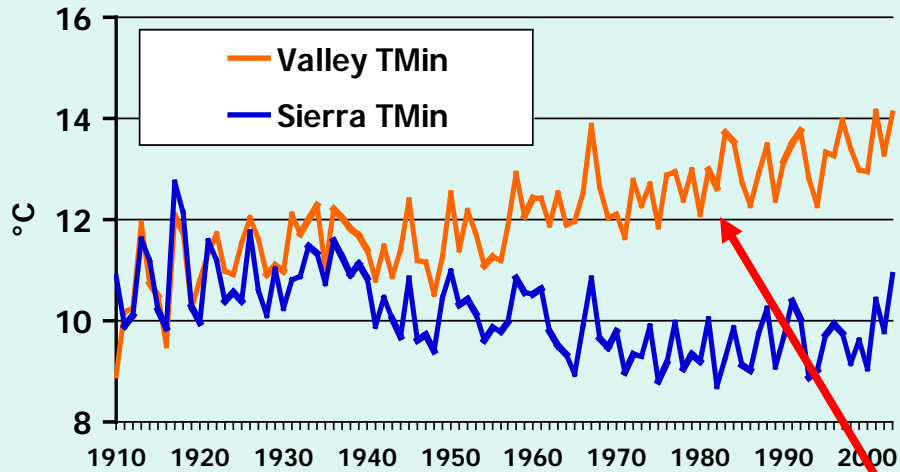


Nighttime temperatures rising but not because of greenhouse gas warming, but are included in popular datasets

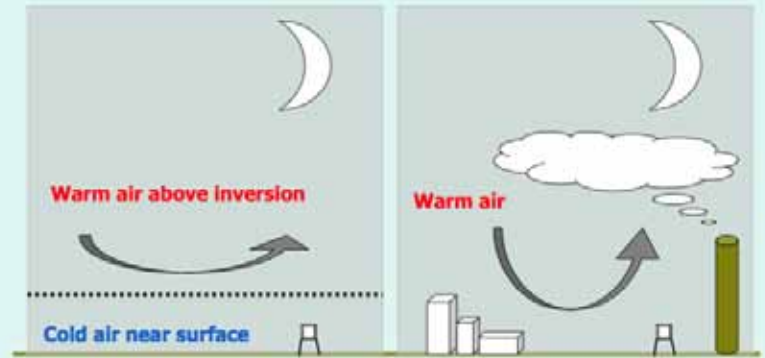
Daytime temperatures tell more accurate story

Christy 2002, Christy et al. 2006, 2007, 2009, Pielke et al 2008, Walters et al. 2007

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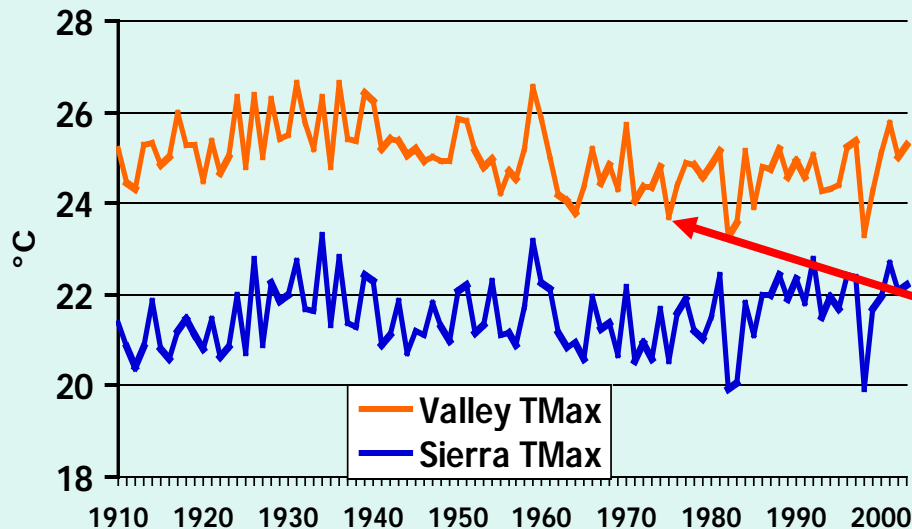
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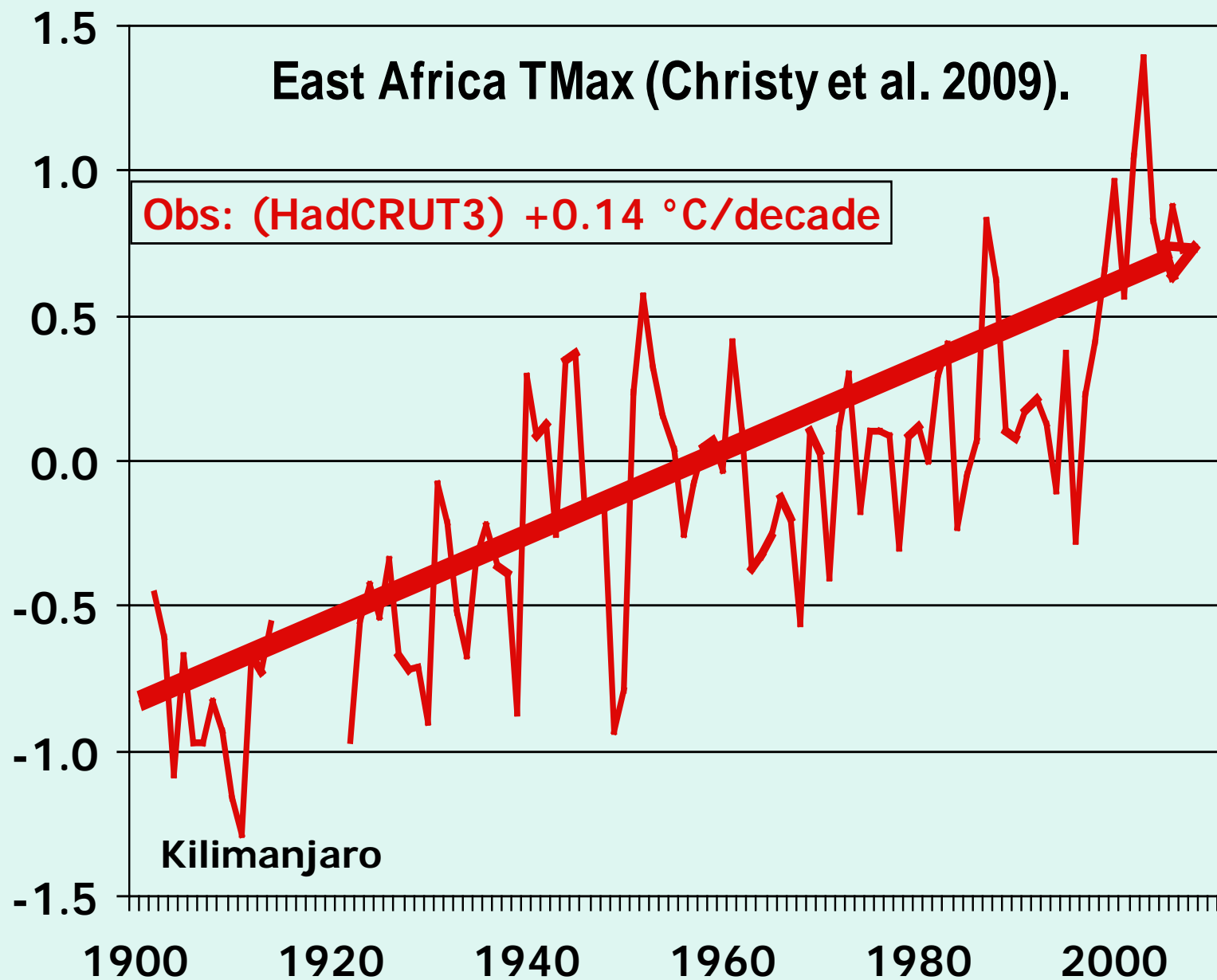
CA Valley and Sierra Annual Avg TMax 1910-2003 .



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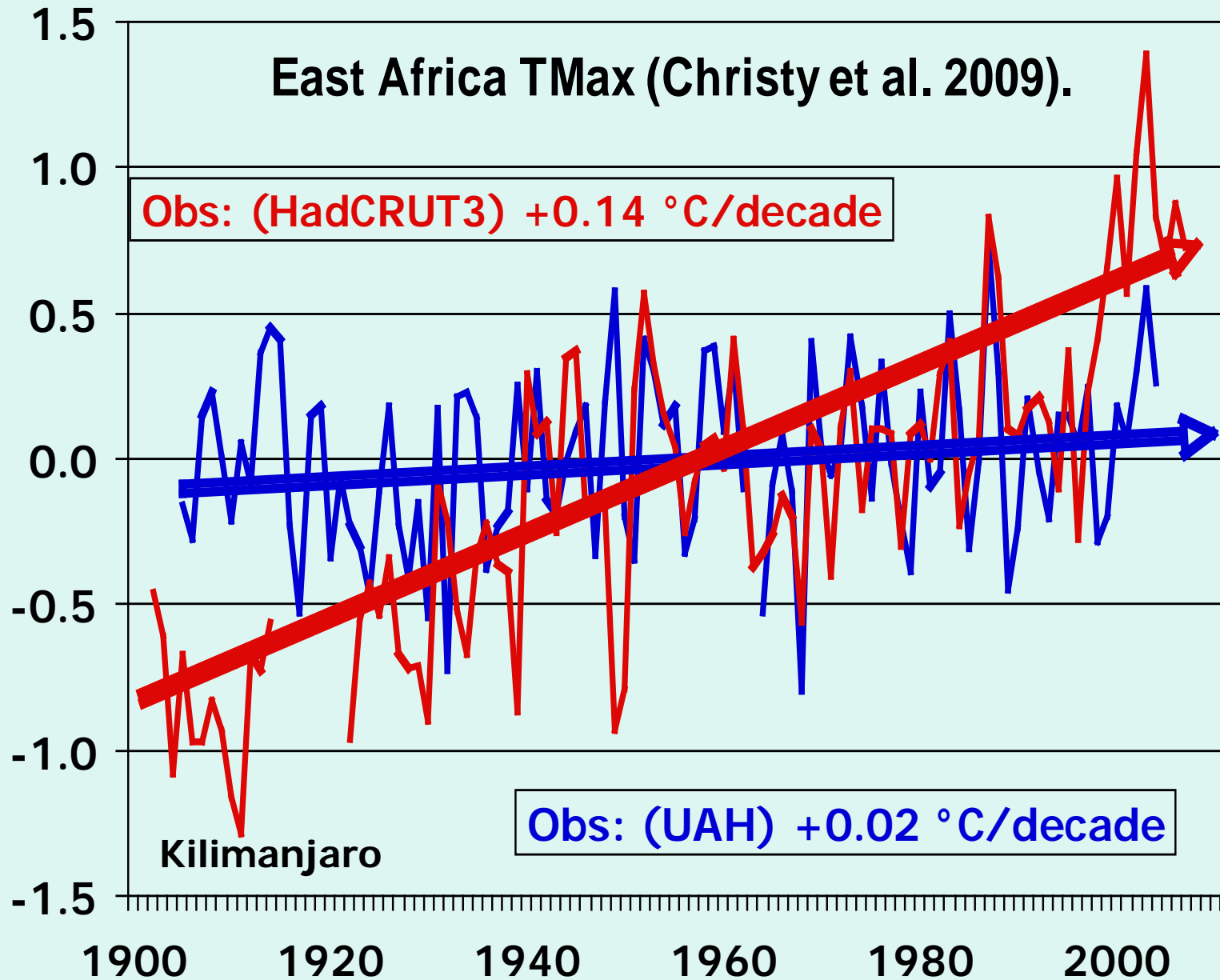


East Africa TMax (Christy et al. 2009).

Obs: (HadCRUT3) +0.14 °C/decade

Obs: (UAH) +0.02 °C/decade

Kilimanjaro

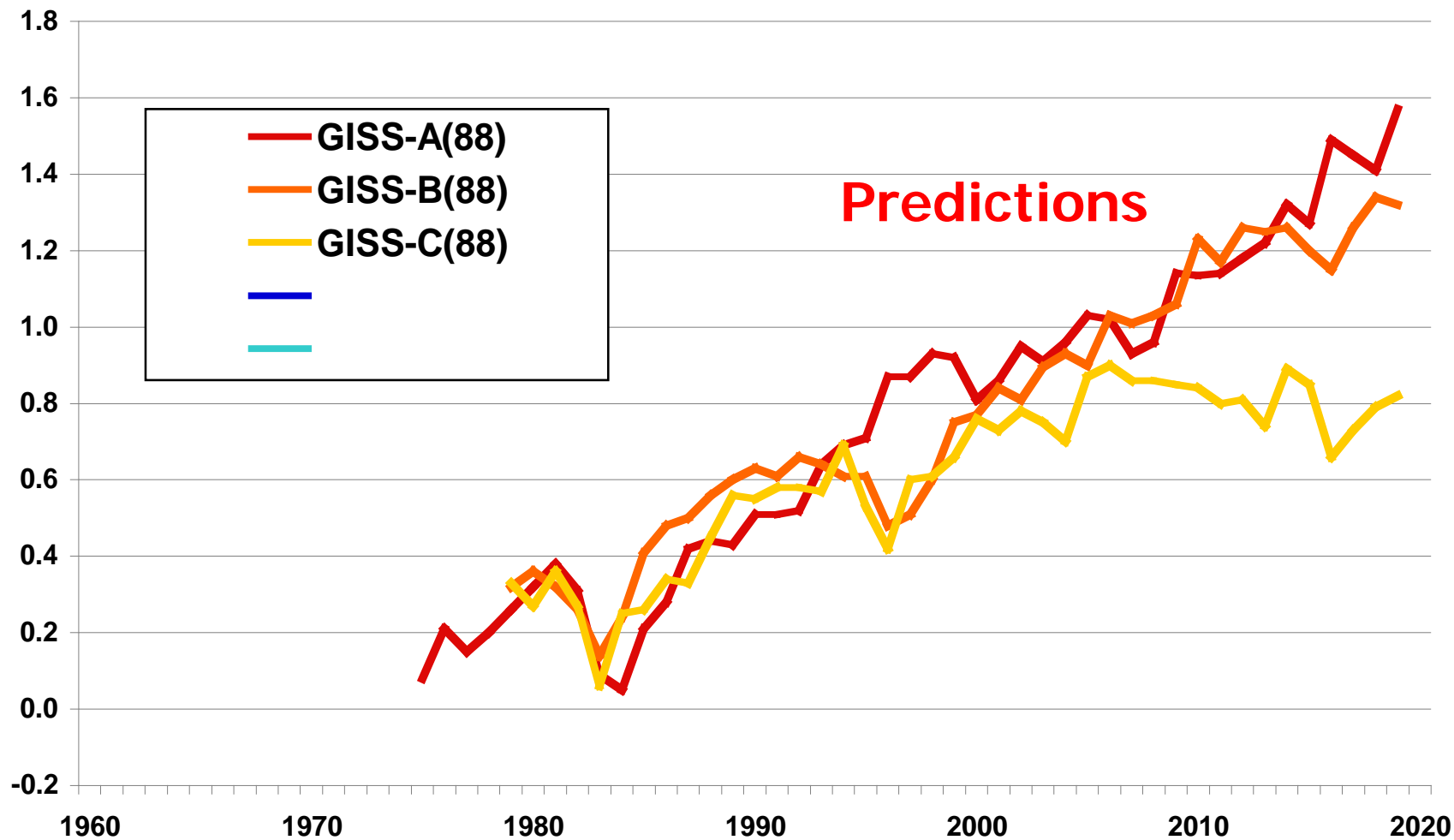


**Testing Hypotheses on Global
Warming**

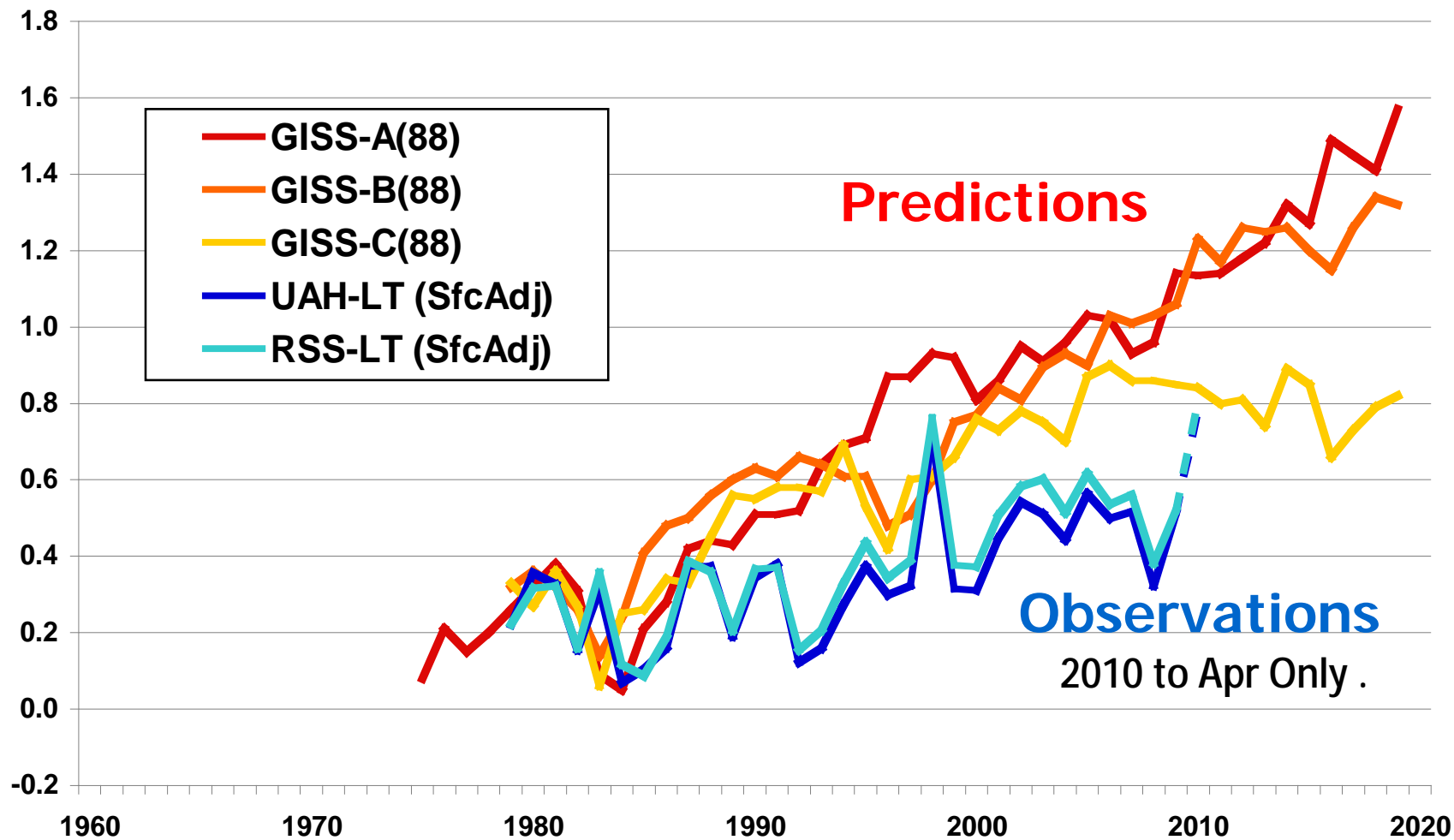
**Testing Assertions based on
Climate Models**

**Climate models overstate the
warming**

History Lesson 1988

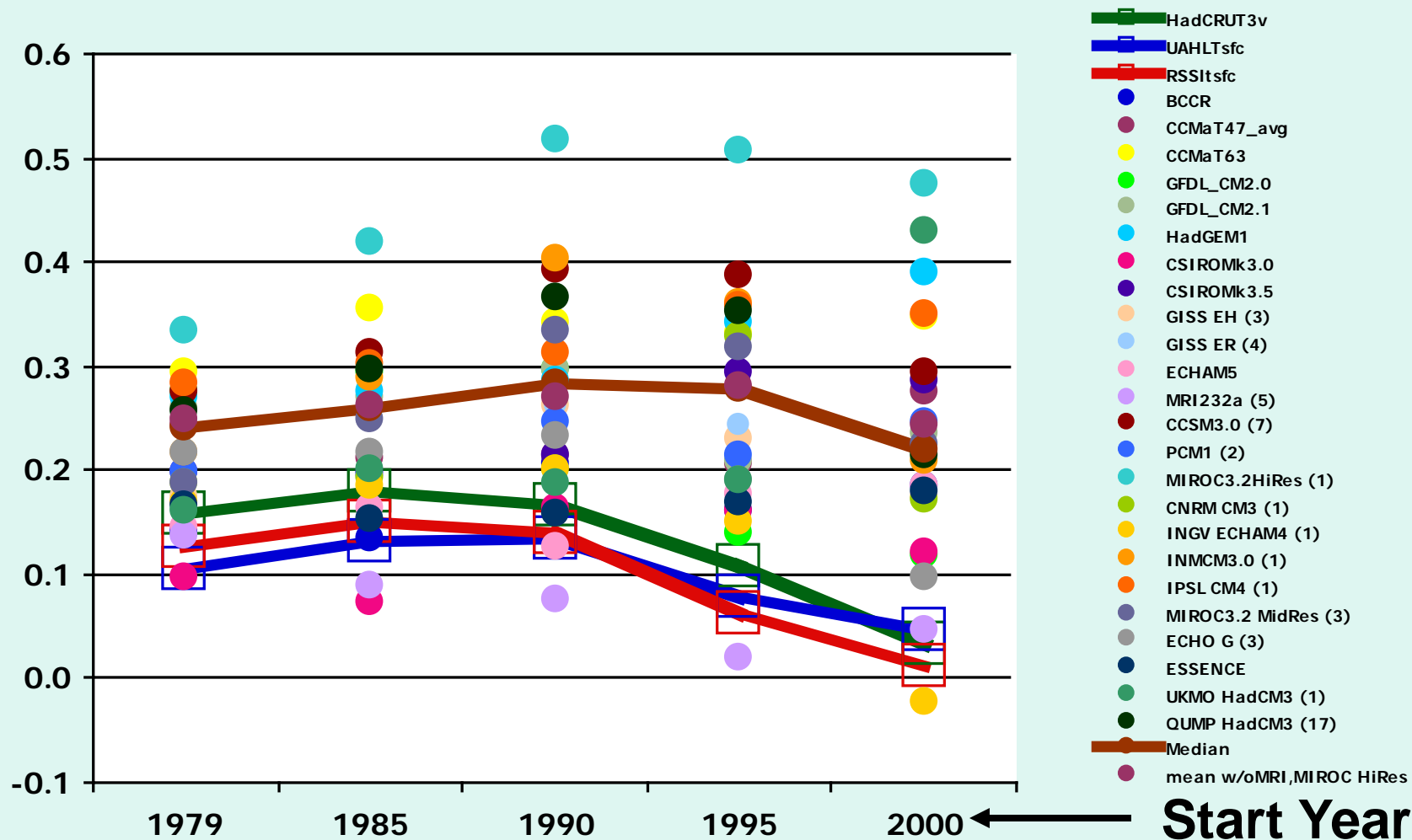


History Lesson 1988



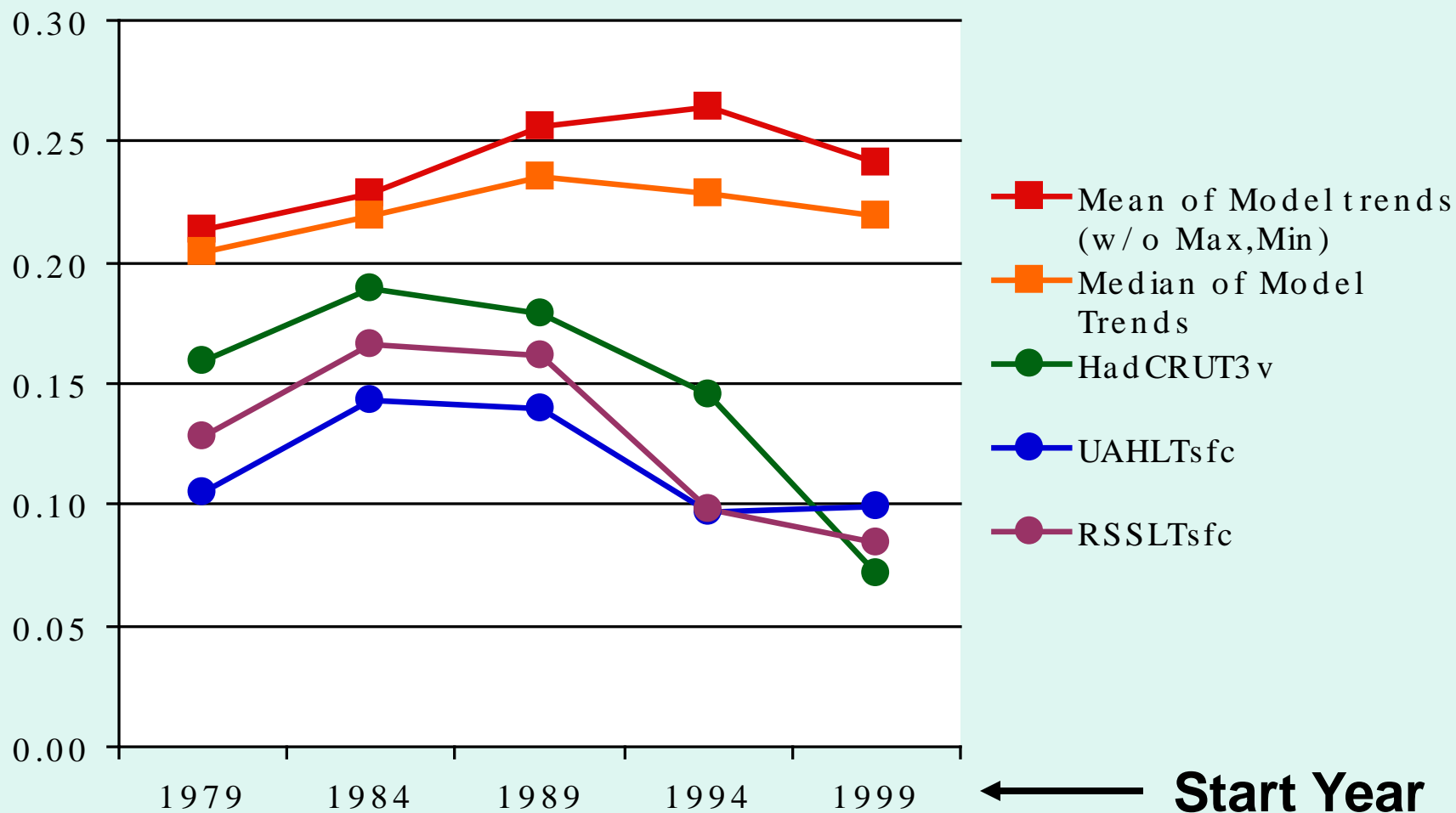
Trends ending in 2008 with various start years

IPCC AR4 Model Runs (22 models) vs. Obs.

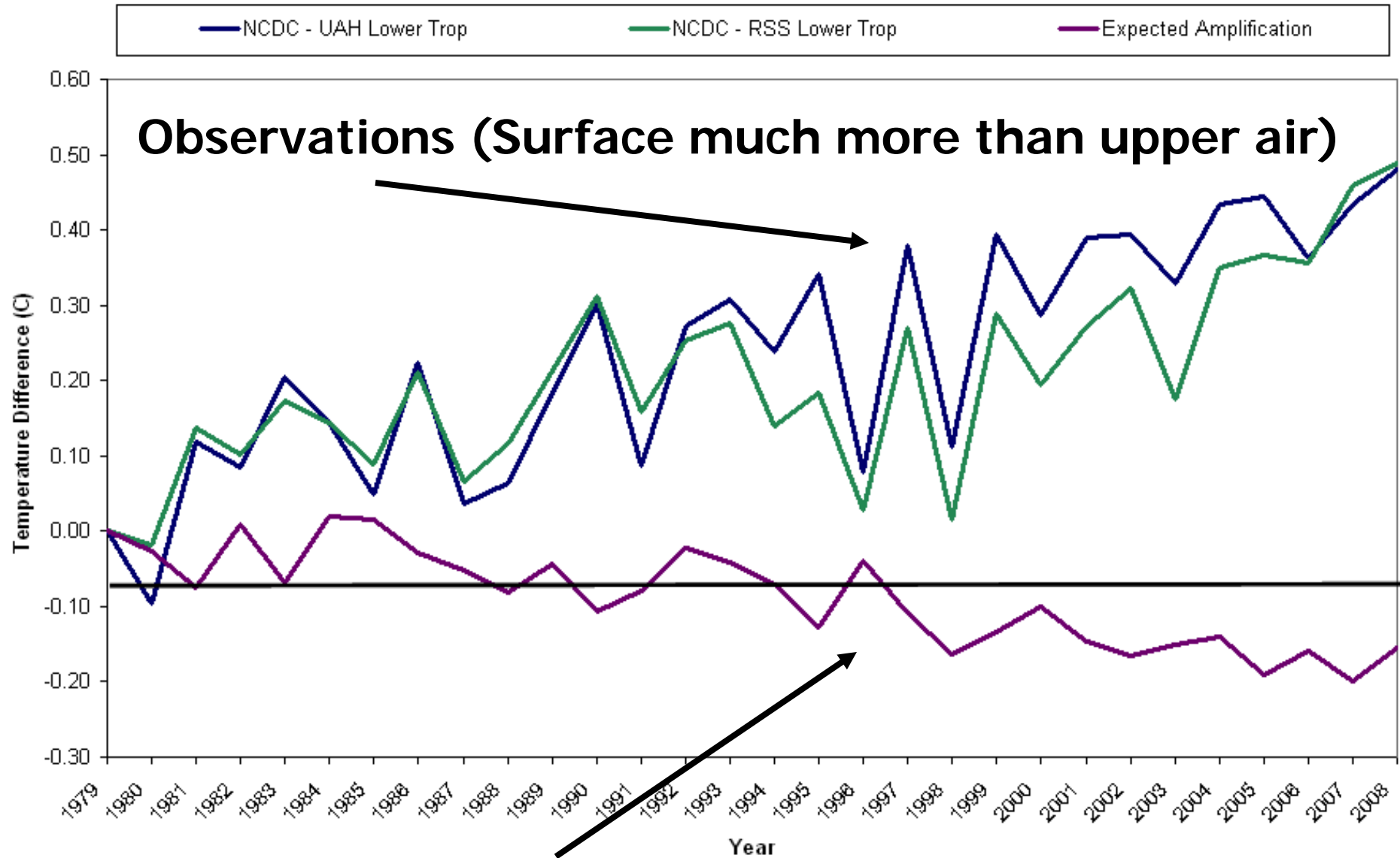


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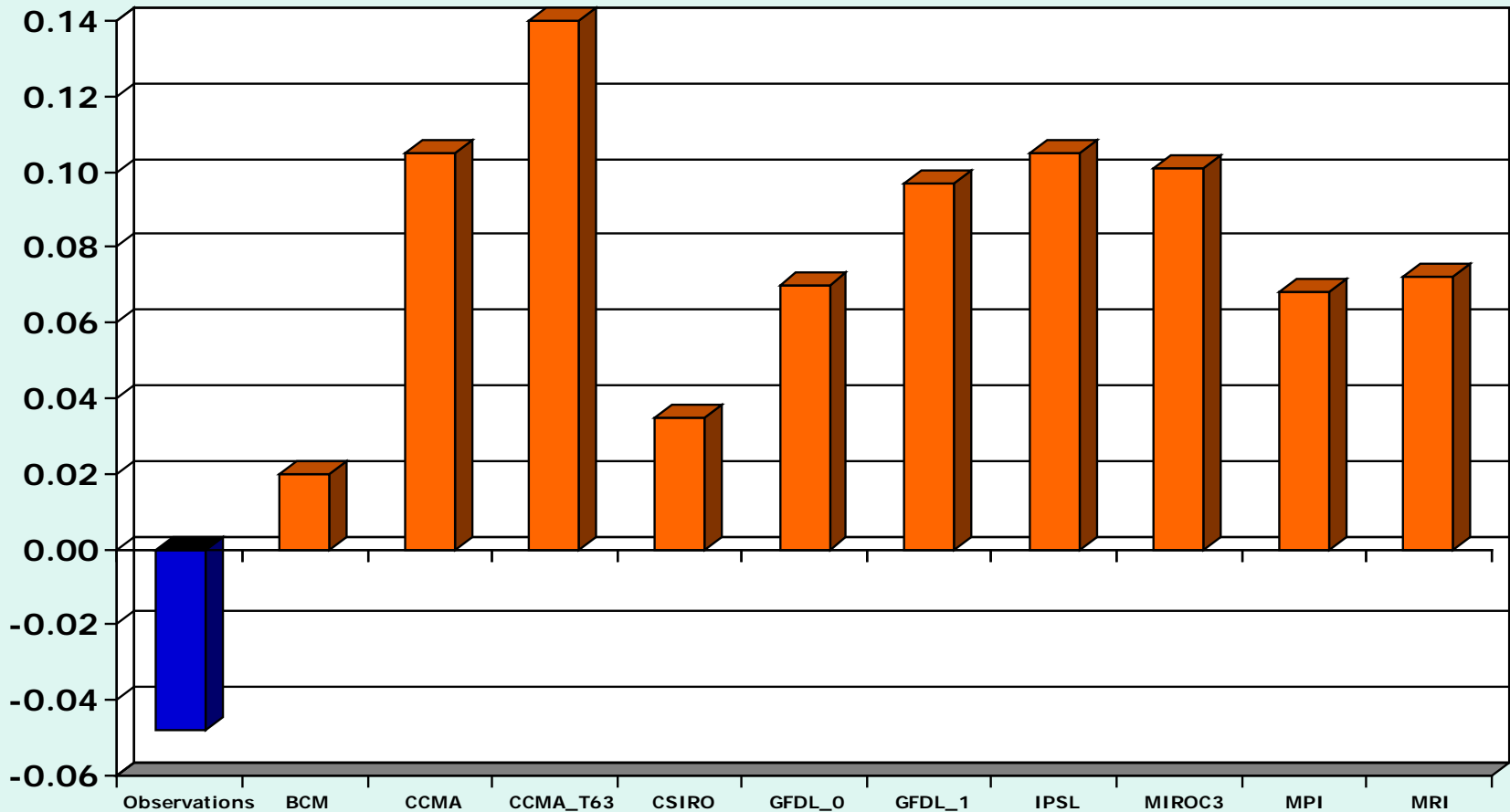
IPCC AR4 Model Runs (22 models) vs. Obs.



NCDC versus Satellite Analysis - Anomaly Difference over Land - Scaled so 1979 Difference is Zero



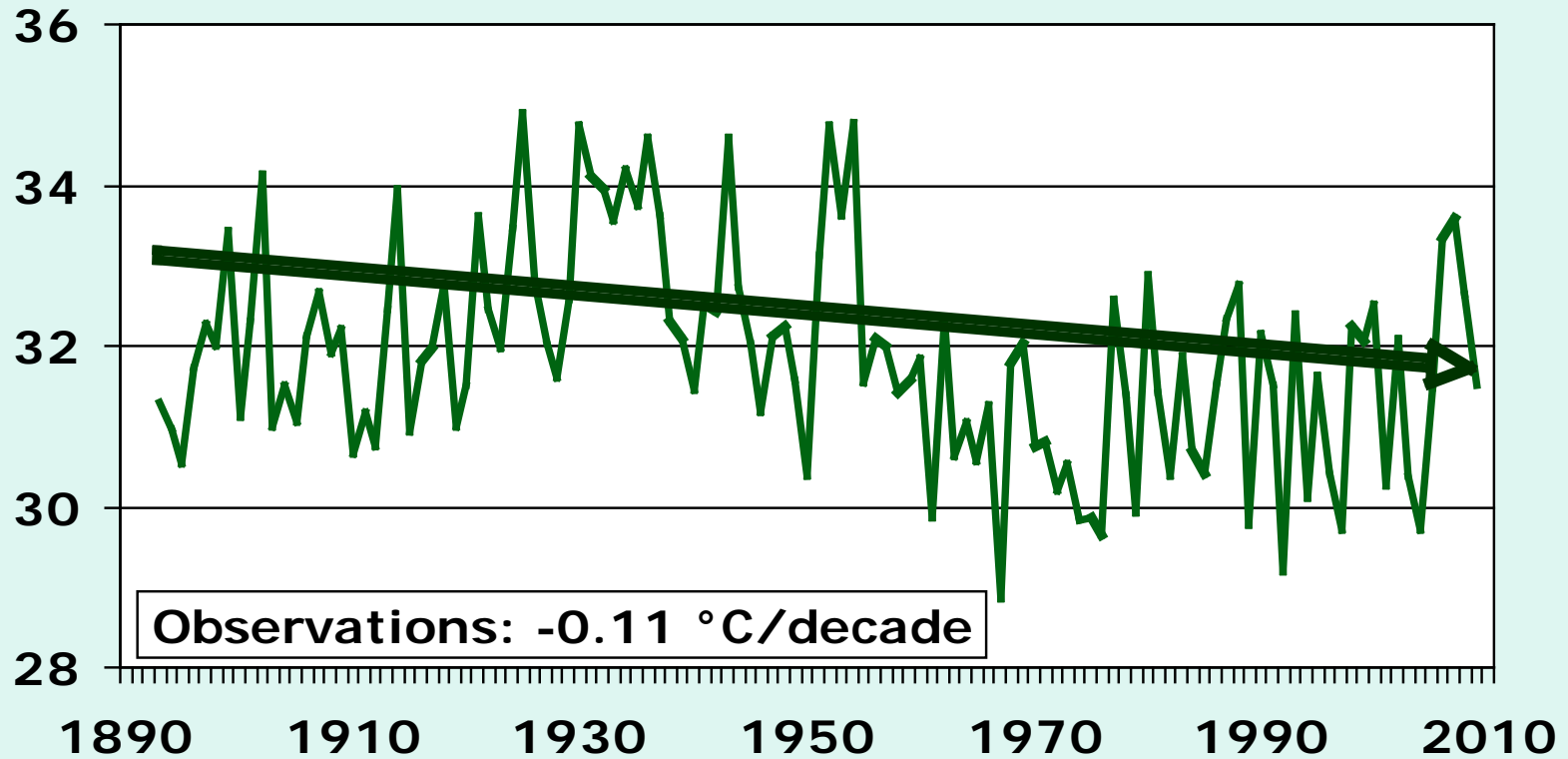
Mean Surface Temperature Southeast USA 1899-2003



Observation

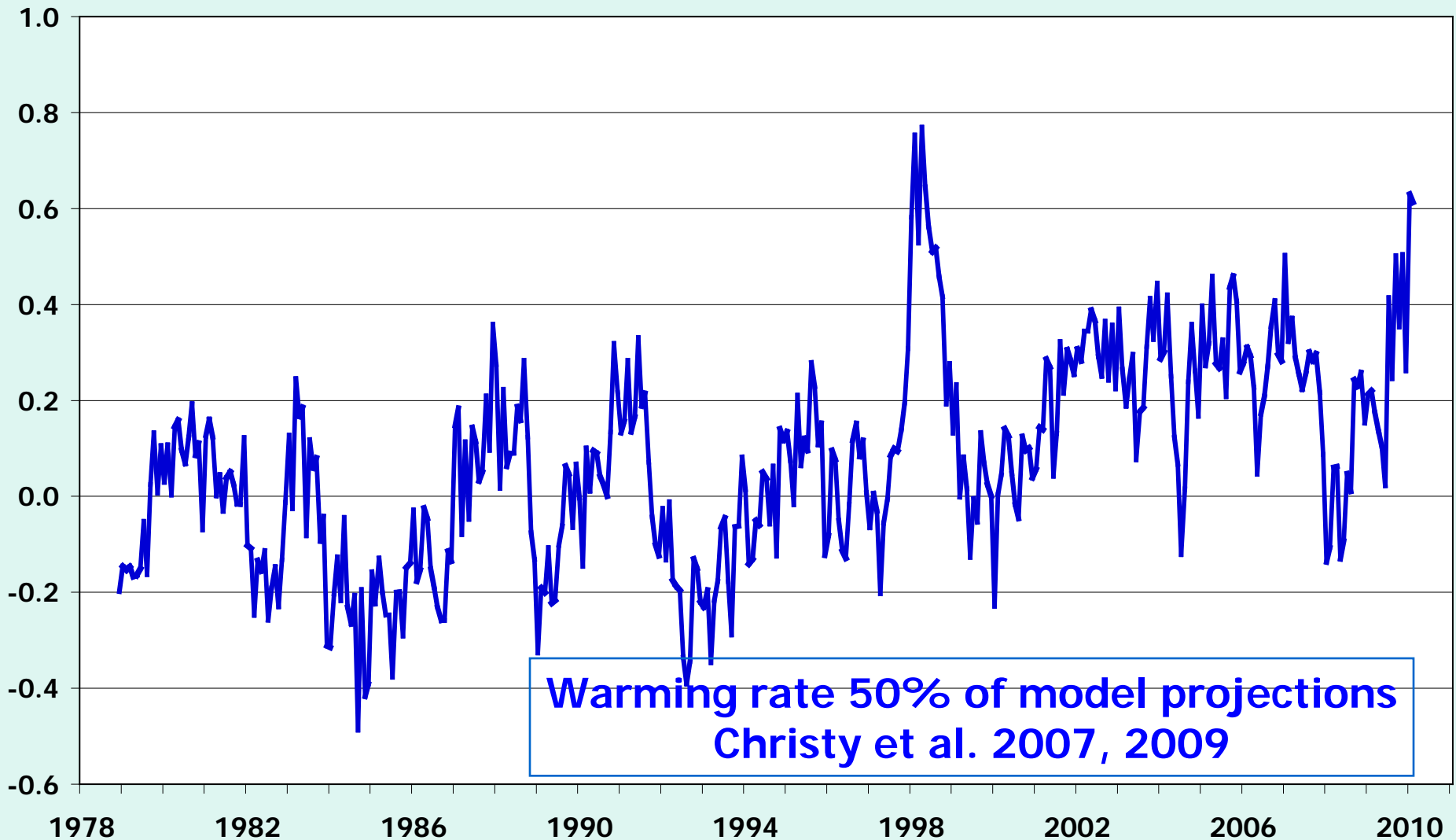
Models

No. Alabama Summer TMax Temperatures 1893-2009

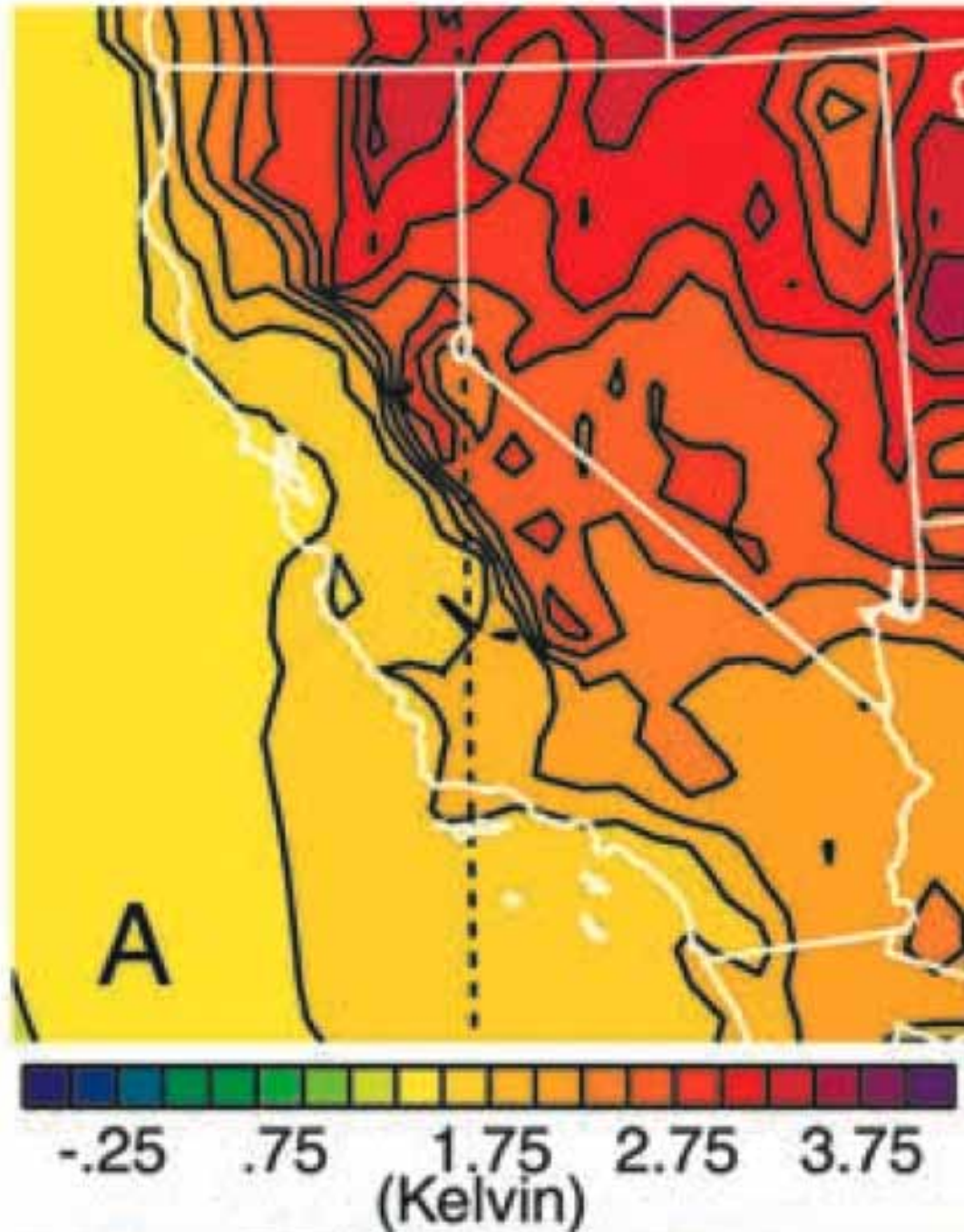


Christy 2002, updated to 2009

Global Bulk Atmospheric Temperatures UAH Satellite Data

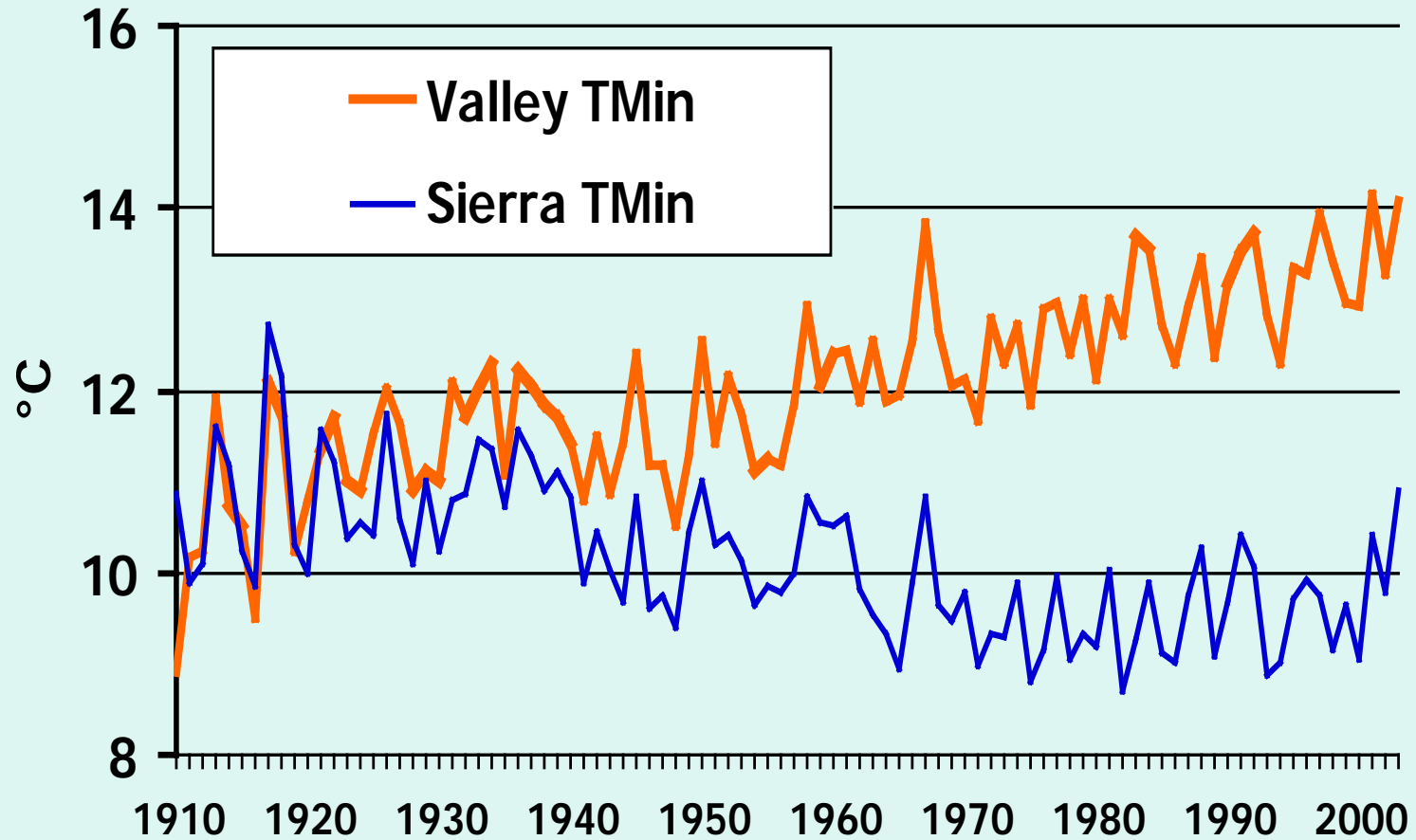


**Sierras
warm
faster than
Valley in
model
simulations**



Snyder et al. 2002

CA Valley and Sierra (Jun-Nov) 1910-2003



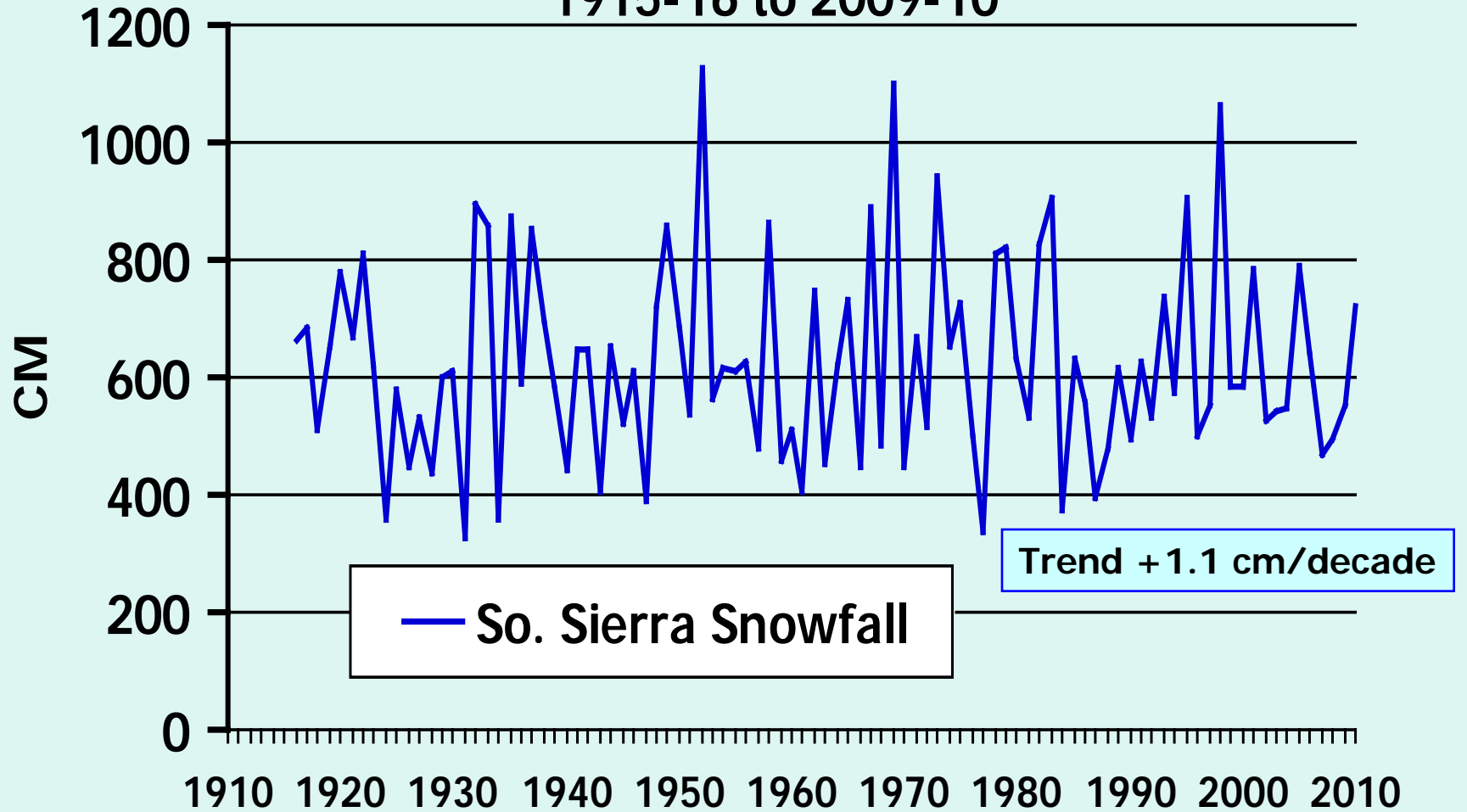
Christy et al. 2006, 2007

Testing Hypotheses on Global Warming

Testing Assertions based on
Climate Models - Sierra Nevada
loses 80% of snow by 2100

Observations contradict this

Southern Sierra Nevada Snowfall 1915-16 to 2009-10

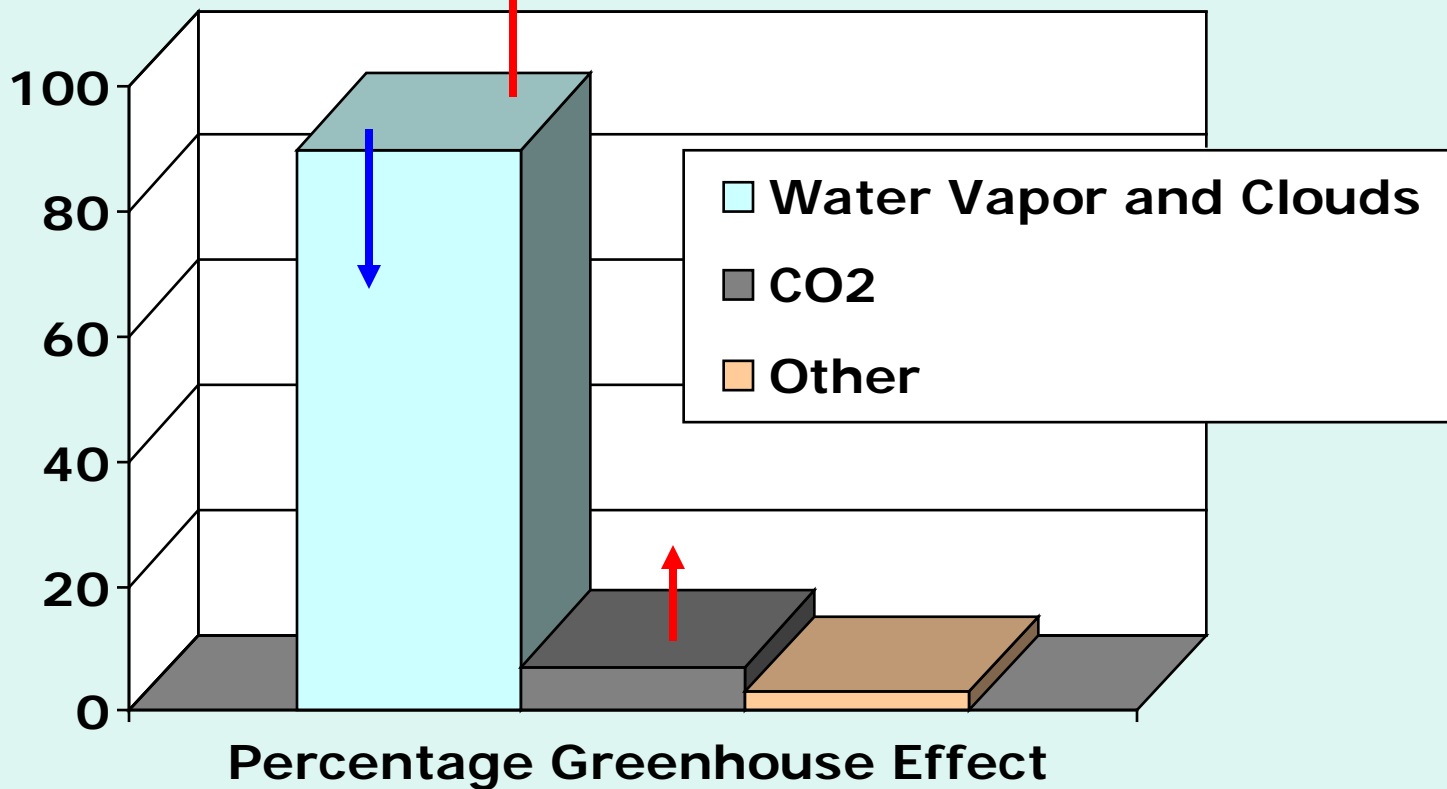


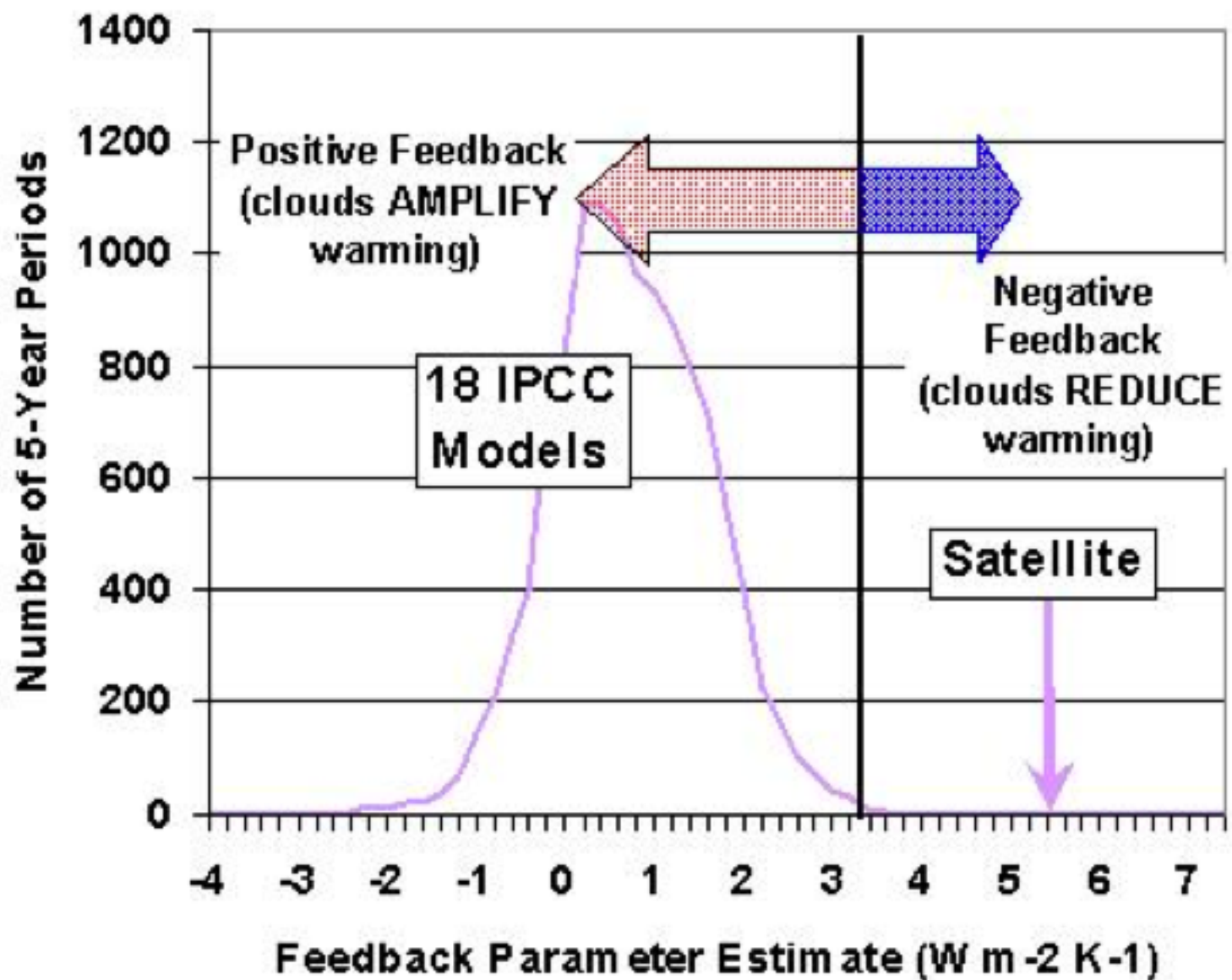
Christy and Hnilo 2010 .

Response of Clouds and Water Vapor to Increasing CO2

Negative Feedback?
(mitigates CO2 impact)

Positive Feedback?
(enhances CO2 impact - models)

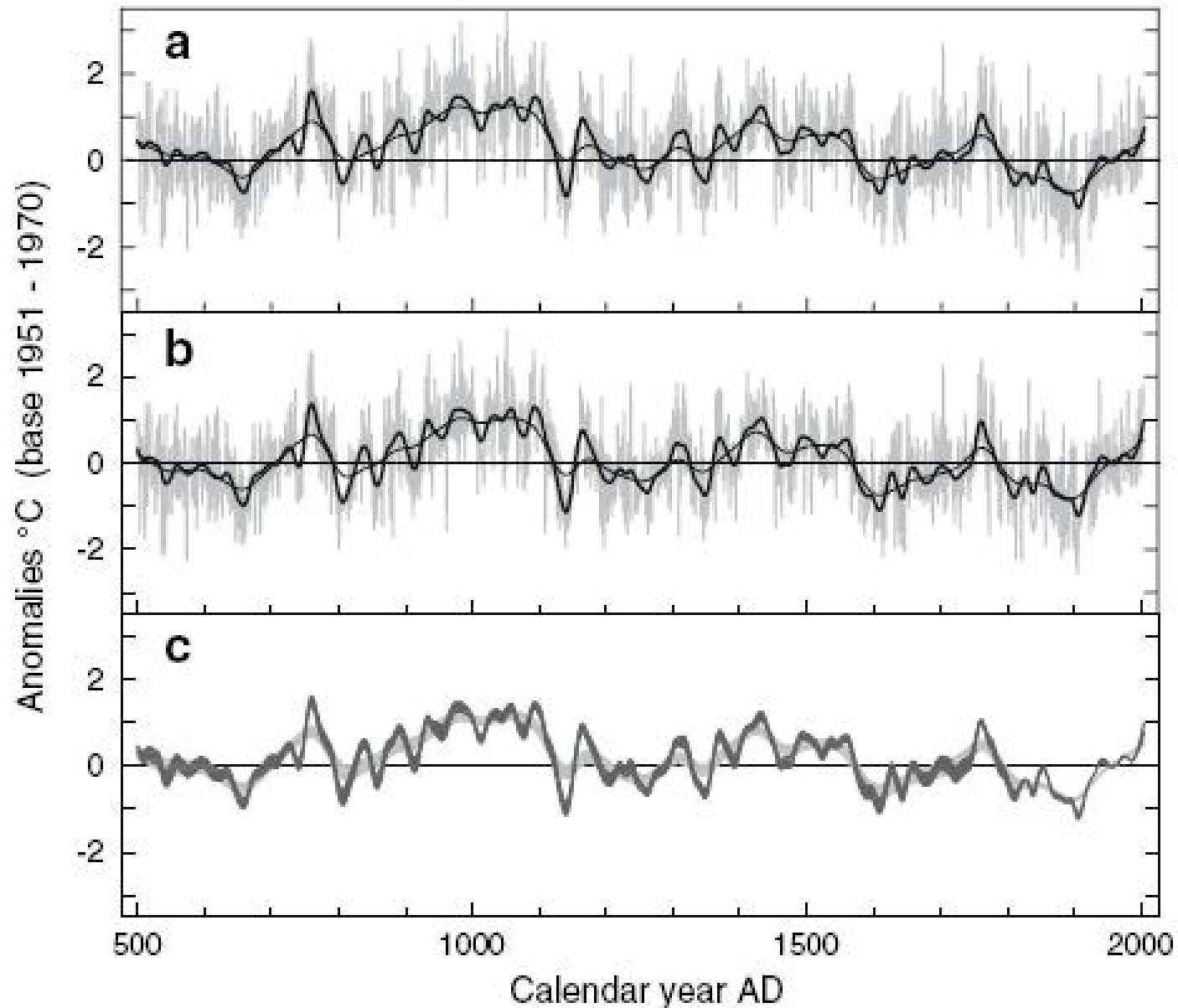




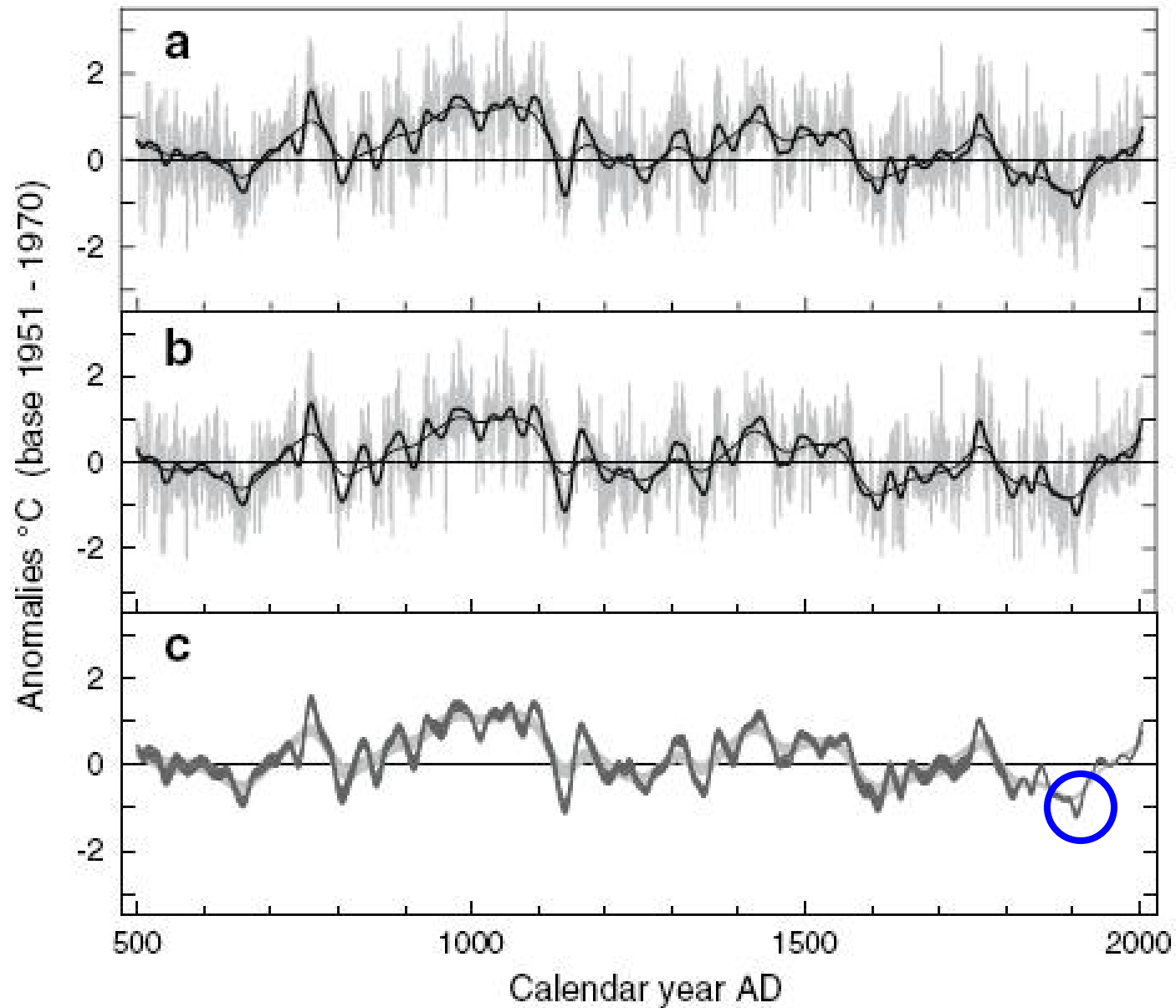
Cold Regions and Polar Bears?

Look at the numbers

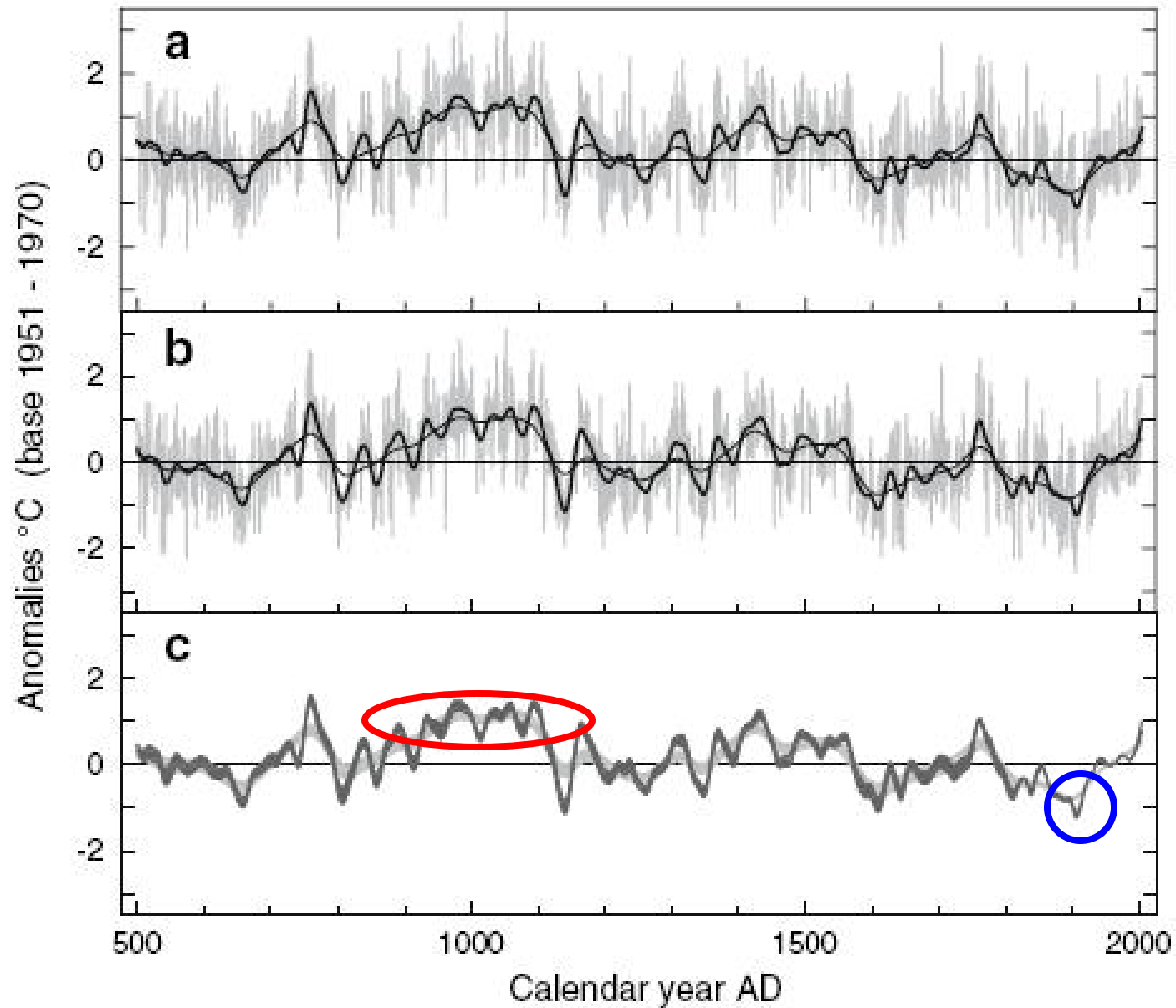
April-August Temperatures, Arctic 500-2000 A.D.



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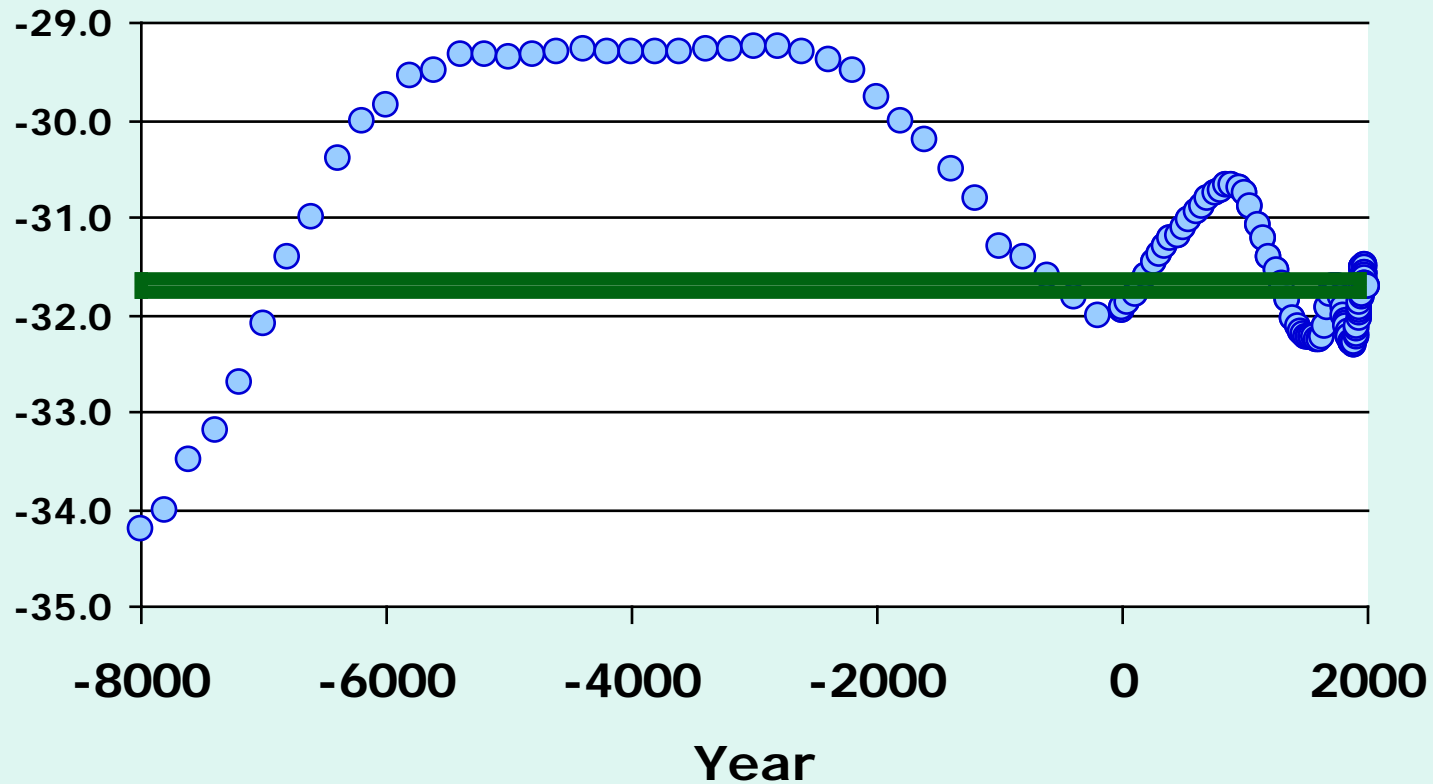


April-August Temperatures, Arctic 500-2000 A.D.



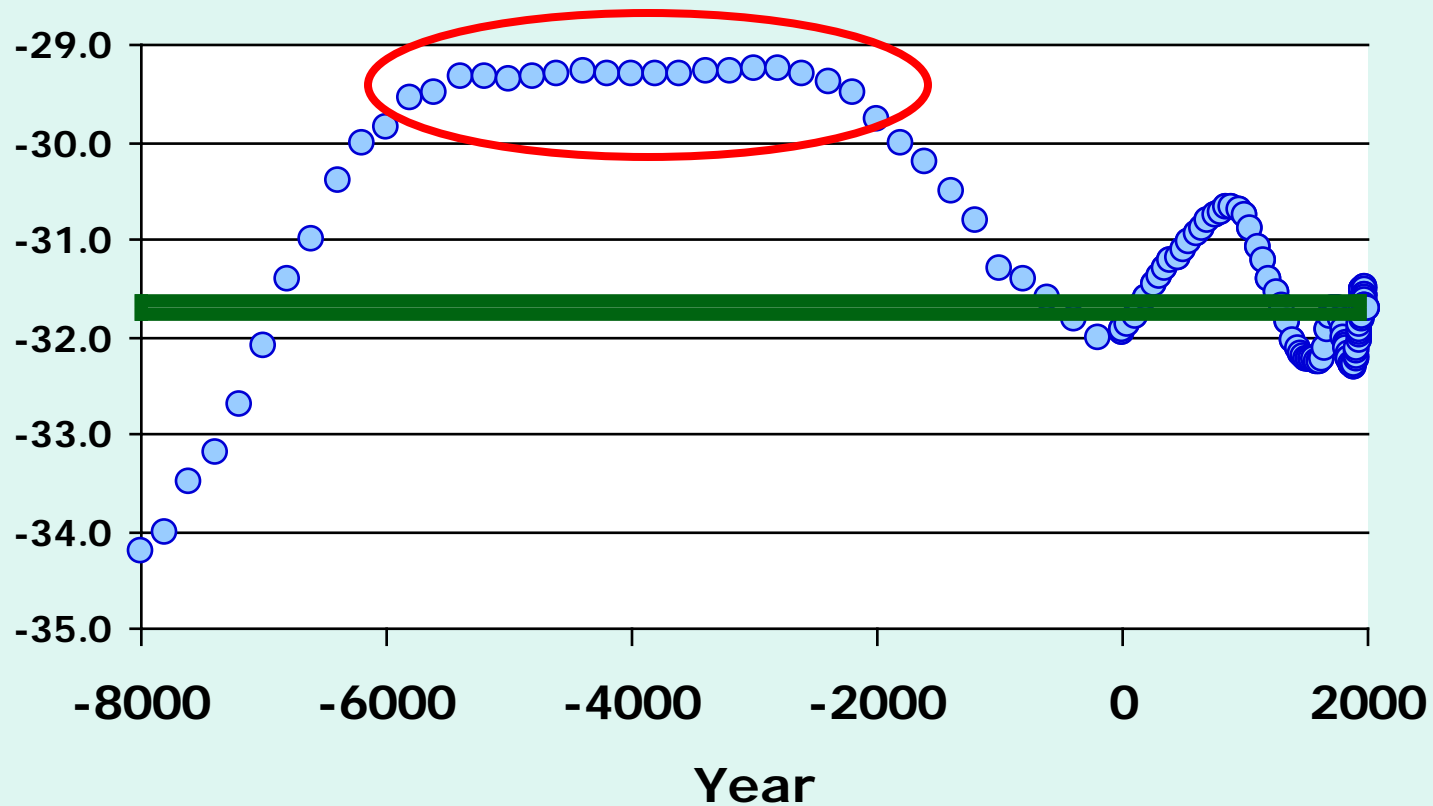
Greenland Borehole Temperature

Dahl-Jensen et al. 1998

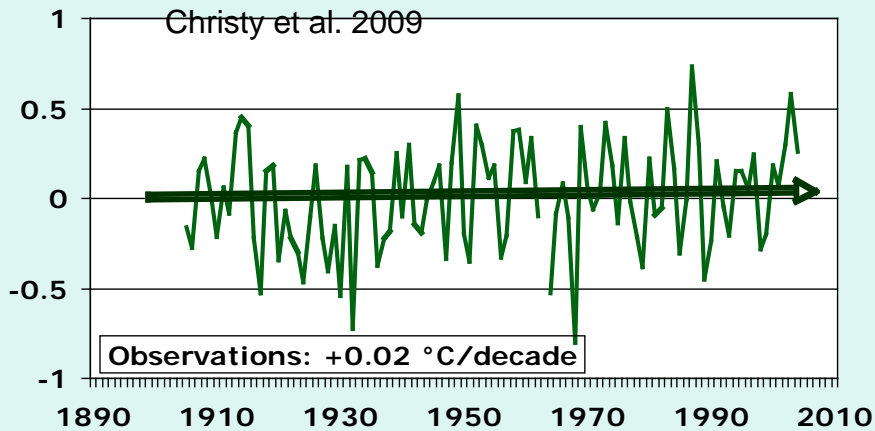


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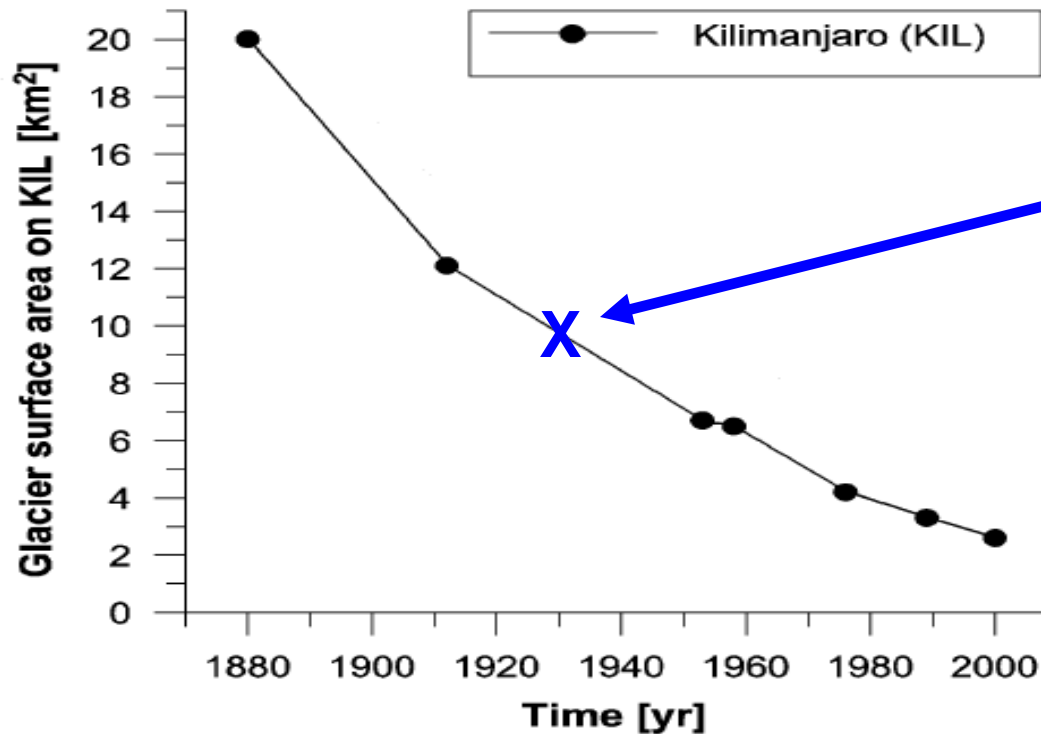
Dahl-Jensen et al. 1998



East Africa TMax



2000



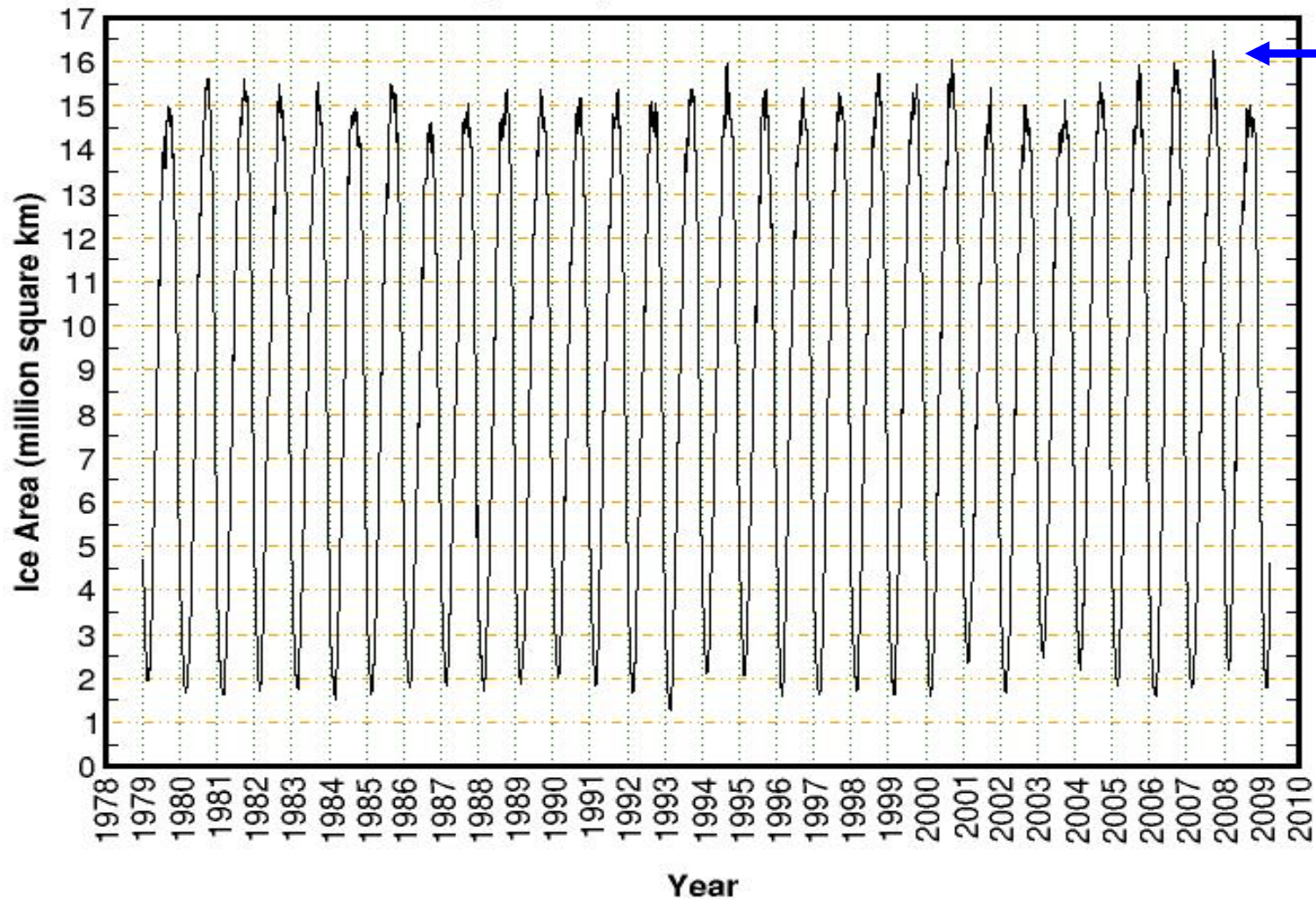
When Hemingway writes “Snows of Kilimanjaro”—half of the “snows” are already gone

Mass Gain in 2006
Molg and Kaser 2007

Antarctica Sea Ice

Southern Hemisphere Sea Ice Area

Data provided by NSIDC: NASA SMMR and SSM/I



As of 15 April 2009, Global Sea Ice 700,000 km² above average — Chapman, U. Illinois

Polar Bears

- 1960's 6,000 to 10,000 bears
- Snow mobiles and high-powered rifles
- 1972 Marine Mammal Protection Act
- 1974 International Agreement for Conservation of Polar Bears
- Today 24,200 polar bears
- ~800 legal kills per year
- Status (scientifically) non-threatened, most subpopulations growing

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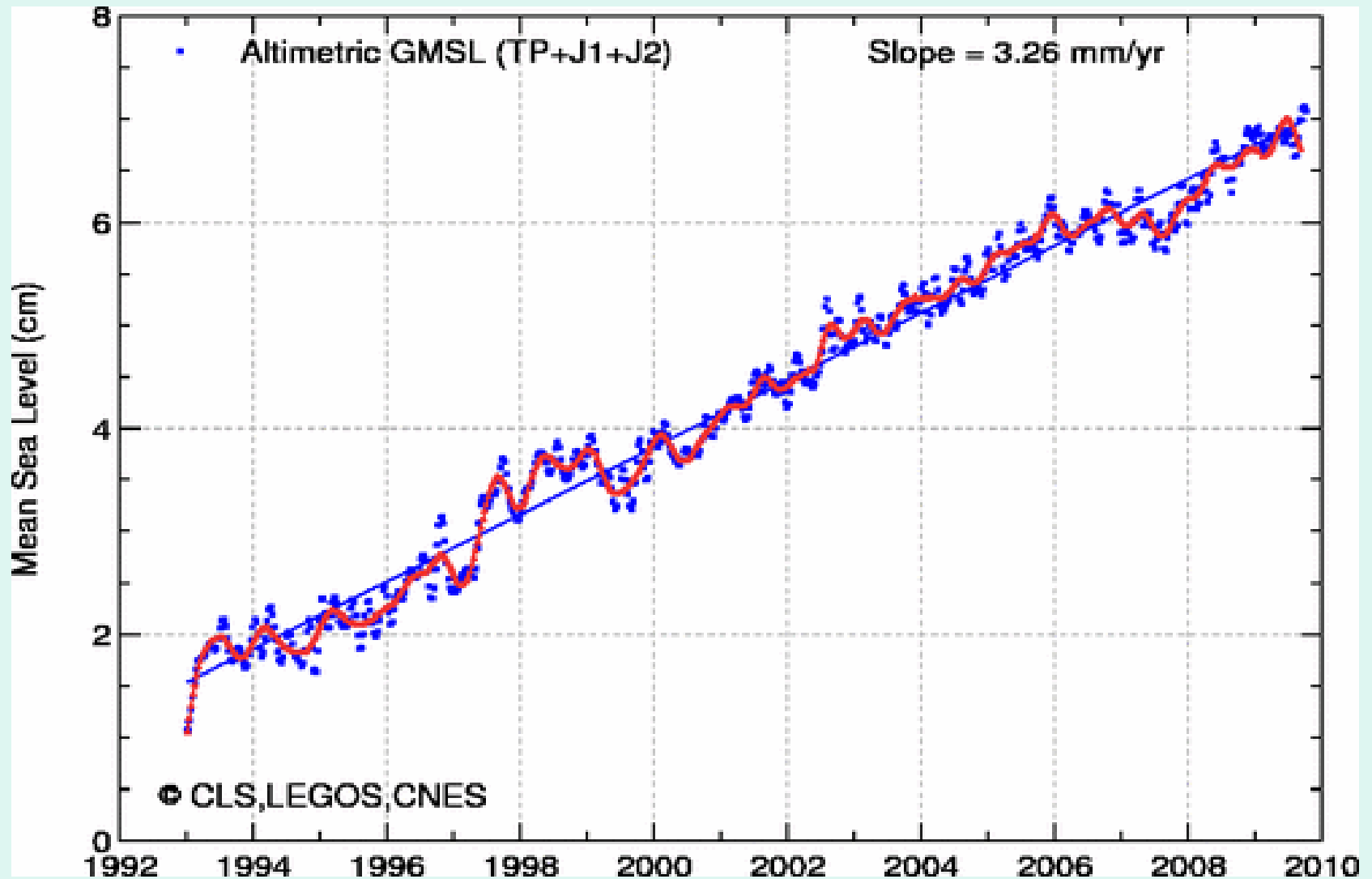
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**Sea level will rise rapidly as
Greenland melts?**

Look at the numbers

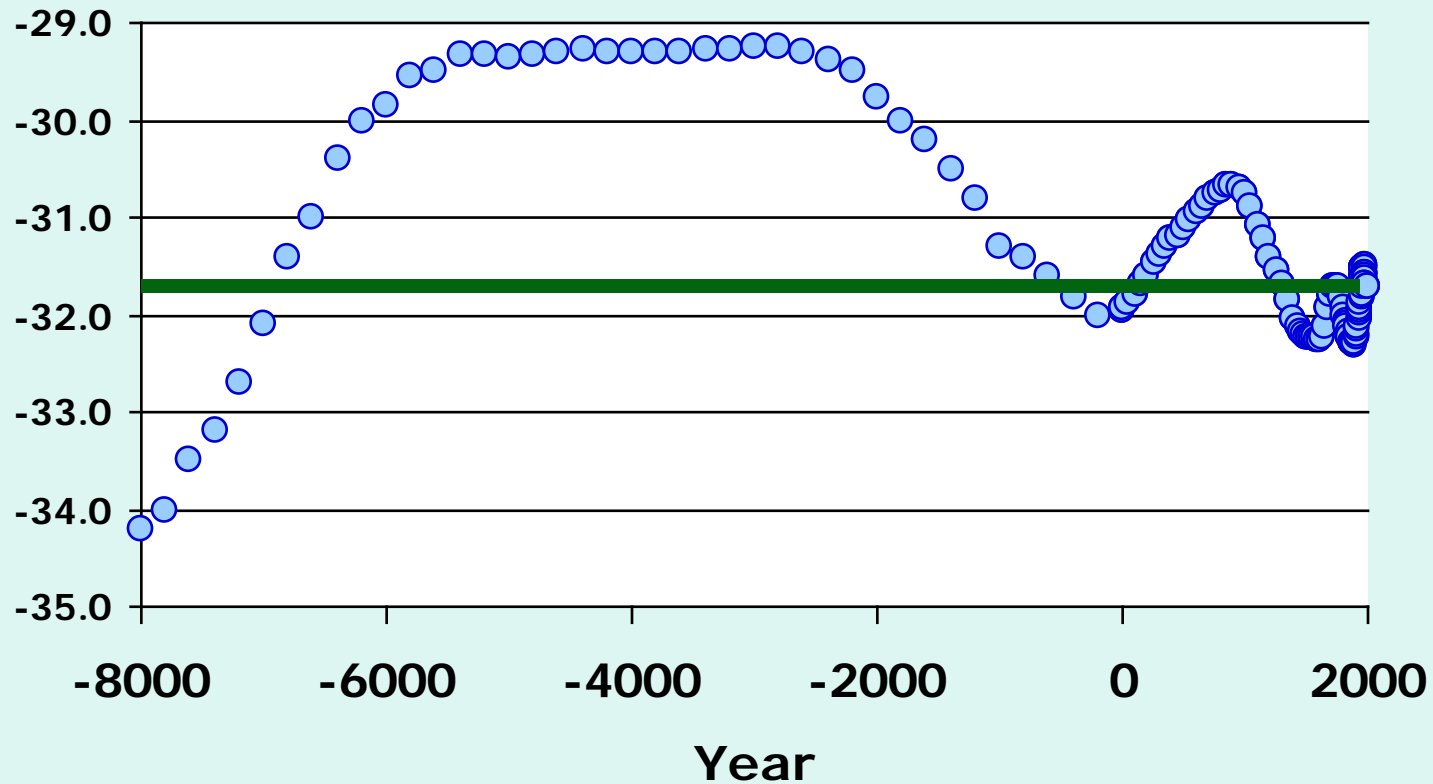
Global Sea Level 1993 - 2009



Bangladesh has added land in last 32 years

Greenland Borehole Temperature

Dahl-Jensen et al. 1998

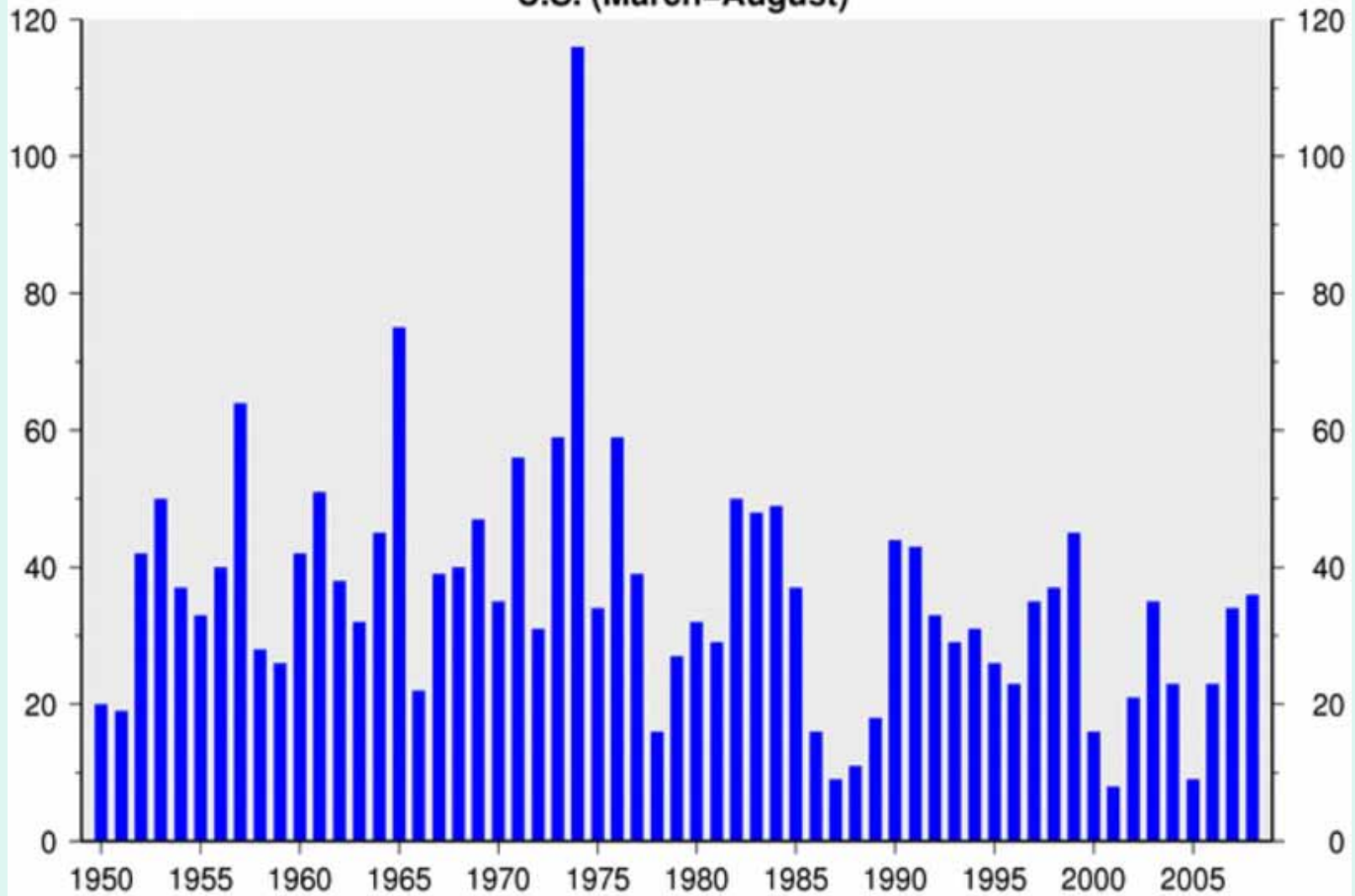


Dangerous weather is more frequent and more intense, in unprecedented ways?

Count the events

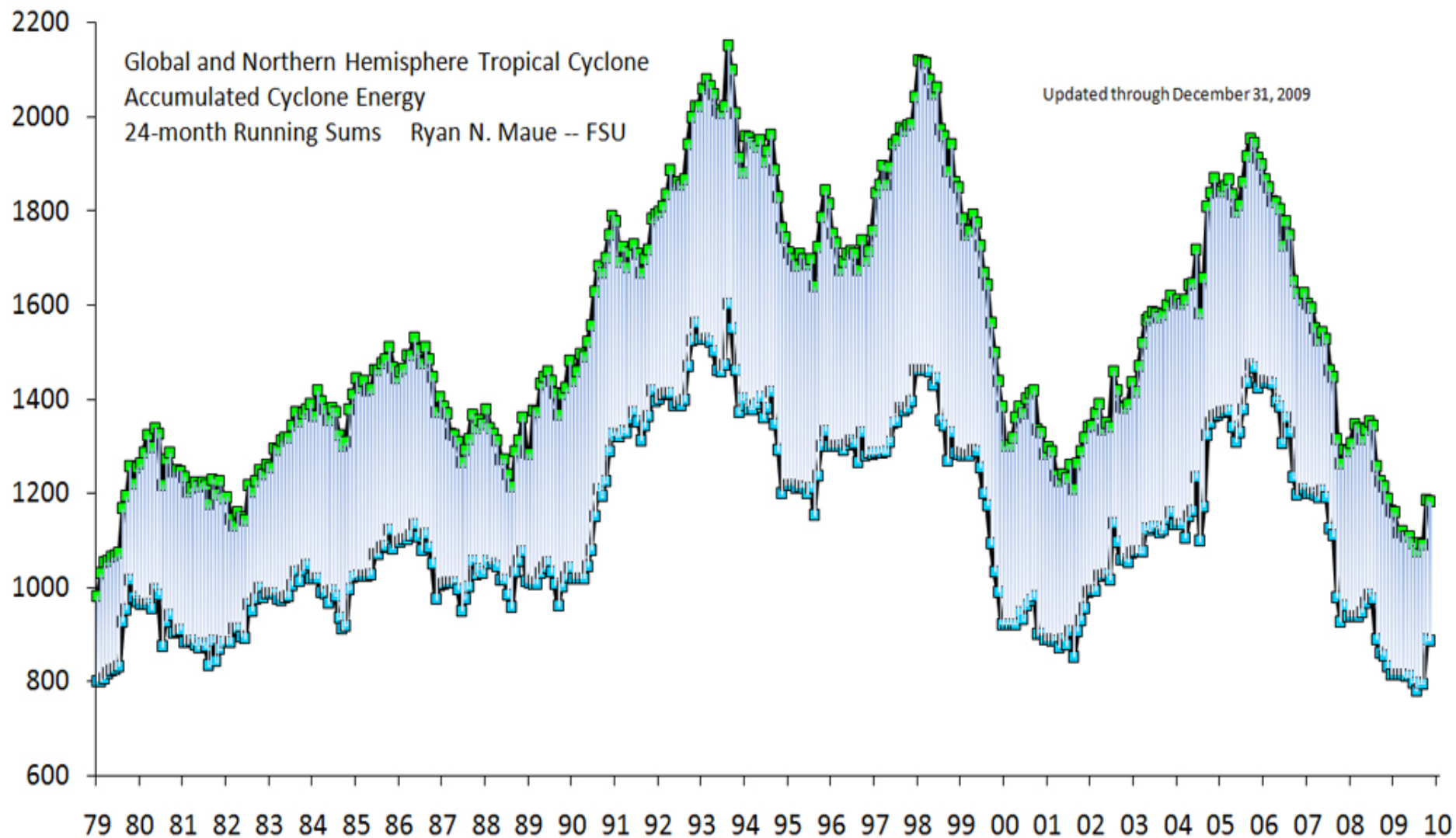
Number of Strong-to-Violent (F3-F5) Tornadoes

U.S. (March-August)

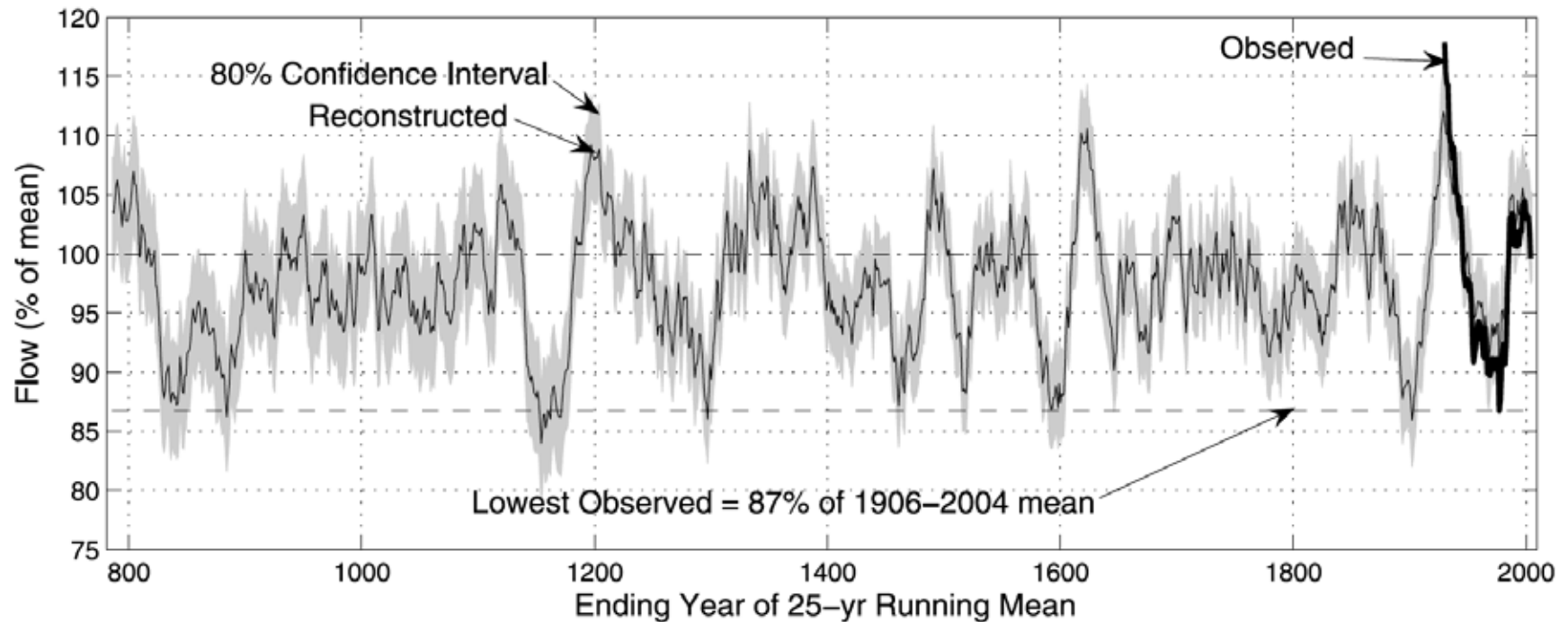


Oklahoma - record long period (> 100 days) without a tornado 2003-04

Accumulated Cyclone Energy (1979 to 2009)



MEKO ET AL.: MEDIEVAL DROUGHT IN UPPER COLORADO RIVER BASIN



“Bringing on prolonged drought, heat waves Greenhouse pollution: Utah warming faster than anywhere else on Earth!”

By Patty Henetz
The Salt Lake Tribune

Gov. Huntsman commissioned the report on Aug. 25, 2006, with the specific instruction that it include a scientific report that was not subject to the same debate as the rest of the issues the council undertook.

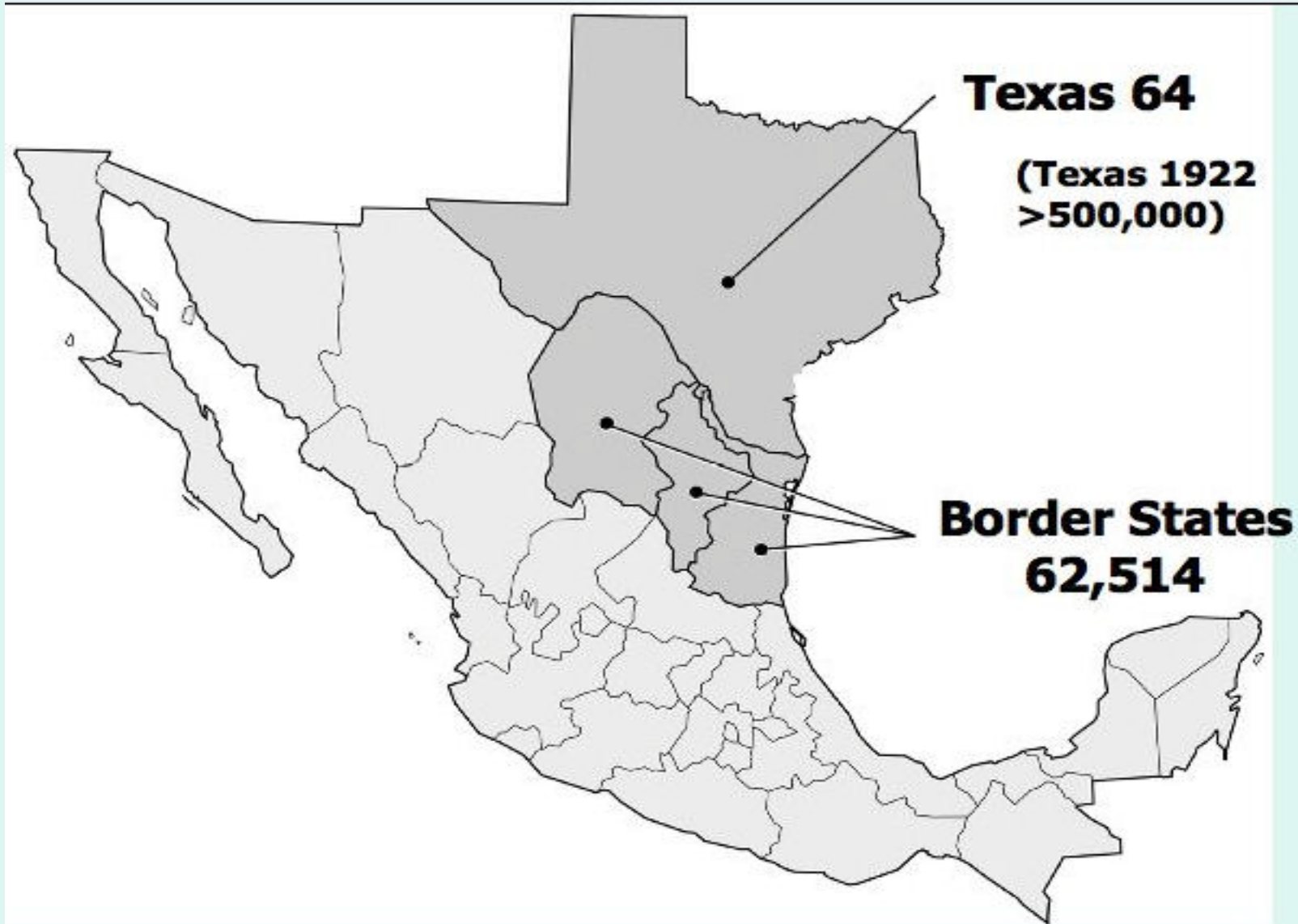
**Malaria, Dengue Fever and
Yellow Fever will increase with
warming**

**Check history and count the
infections (Paul Reiter)**

Climate Change and Mosquito-Borne Disease

Paul Reiter

Dengue Branch, Division of Vector-Borne Infectious Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, San Juan, Puerto Rico



Clinically Diagnosed Dengue 1980-1999

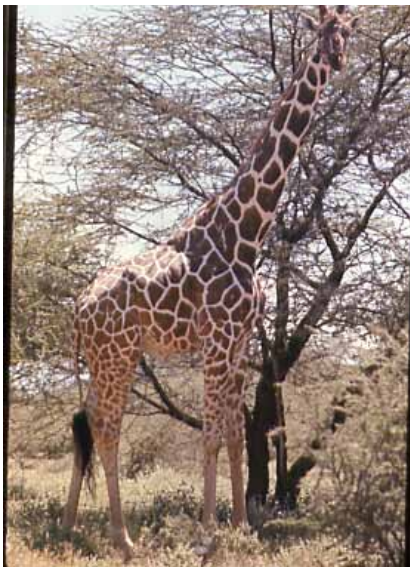
Evidence Thus Far

- Global surface temperature is rising, but in a way inconsistent with model projections of GHG forcing
- Overall decline in ice mass, with sea level rise of about 1" per decade
- Severe weather not becoming more frequent
- Diseases are first a function of public health infrastructure

**Please don't demonize
energy because:**

**Without energy, life is
brutal and short**

Kenya, East Africa



Energy System

Energy Source



Energy Transmission



Energy Use



The Dilemma of “doing something about global warming”

- Meet significant growth in energy demand
- Reduce CO₂ emissions substantially and thus “manage the climate”

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What did California do?

- **Force a limit on emissions of Light Duty Vehicles**
- California AB 1493 seeks to reduce tailpipe emissions of CO₂ by 26% by 2016
- 11 NE States adopted AB 1493
- Trial in Federal Court (Burlington VT) to address the engineering, legal and climate issues of AB 1493, April-May 2007

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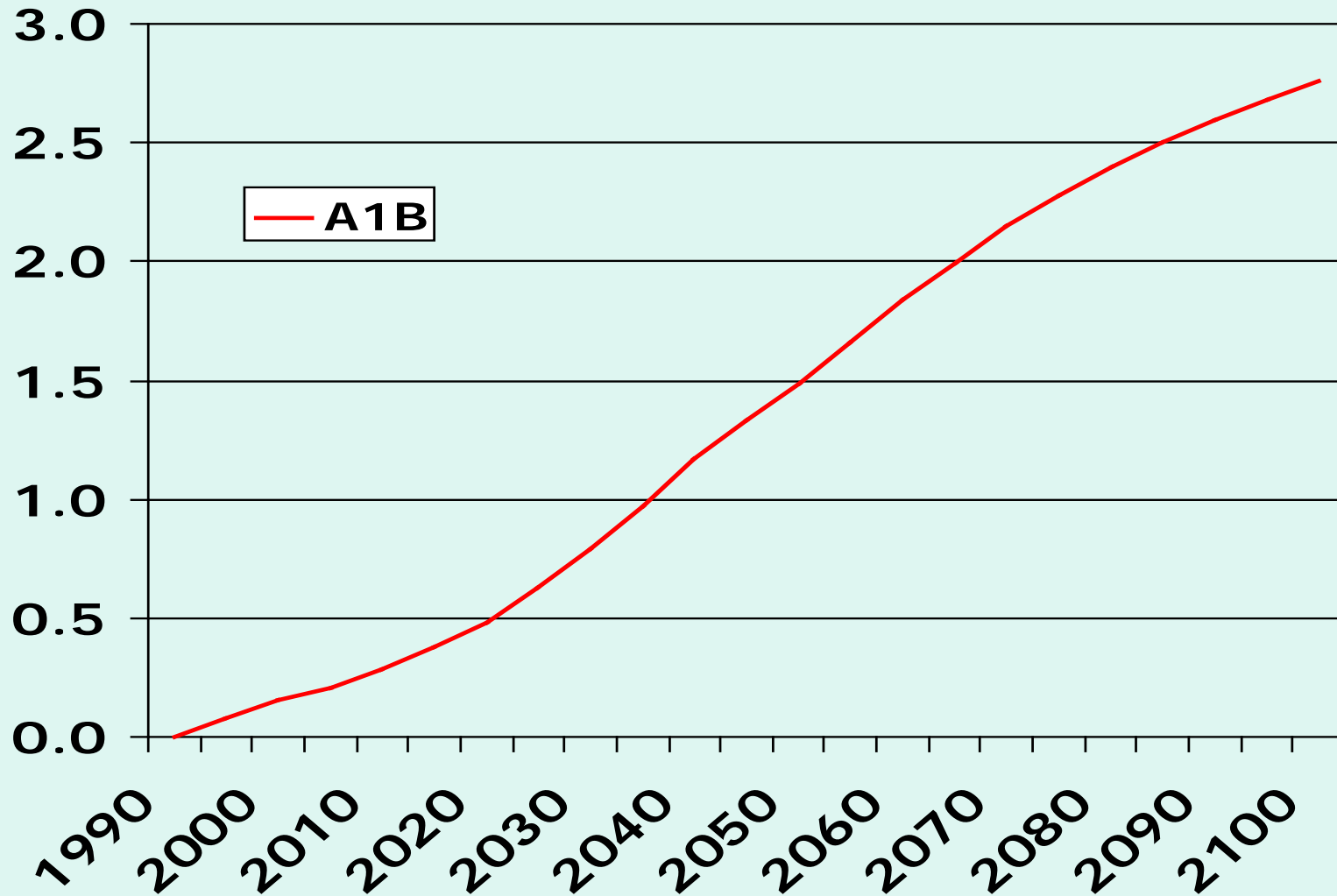
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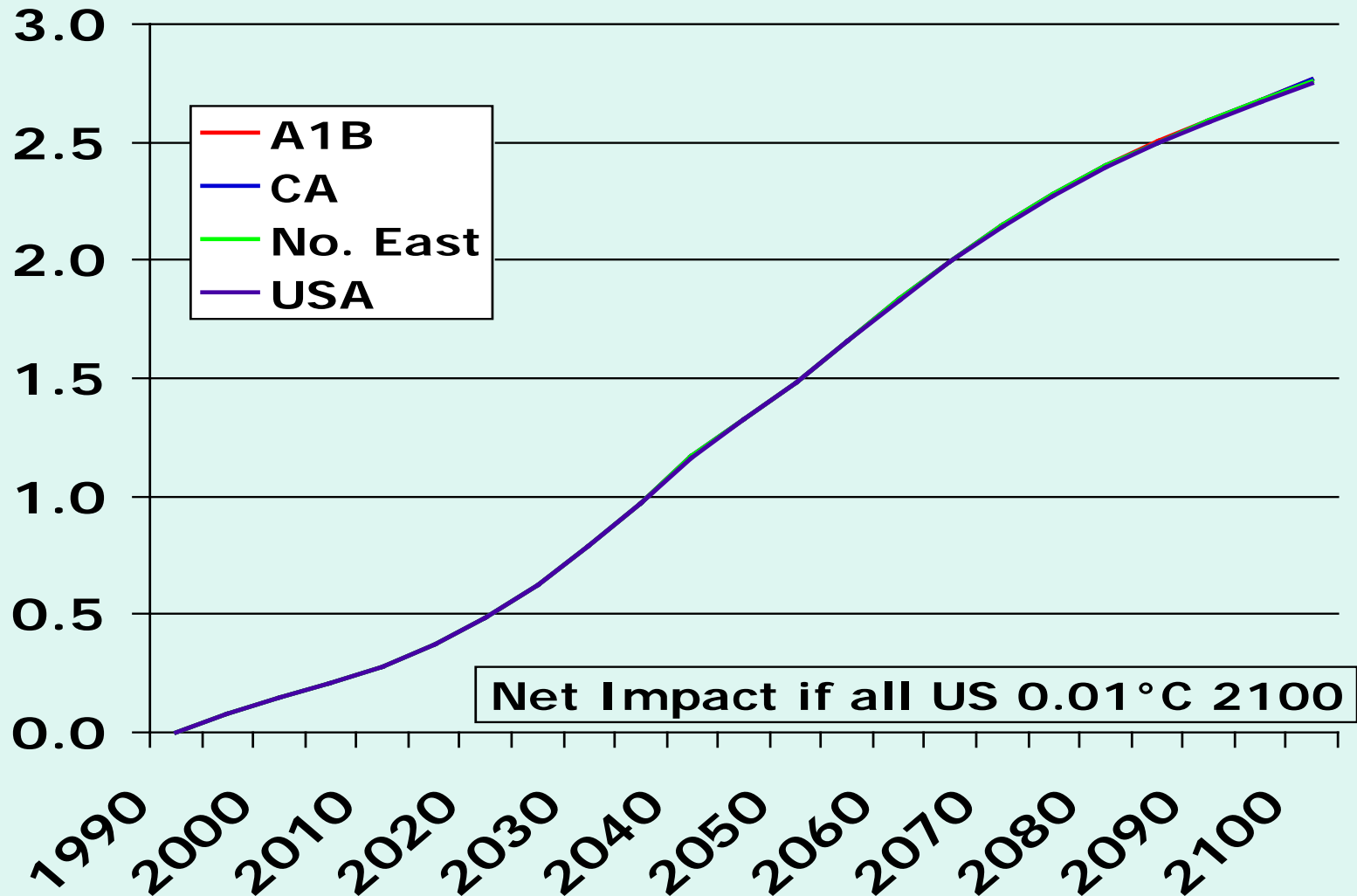
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IPCC "Best Estimate"



California AB 1493

26% CO₂ reduction LDV 2016



The temperature impact on global temperatures if the *entire world* adopted AB 1493 is an undetectable 0.03°C.

Latest sensitivity results suggest the impact is even smaller.

Judge William Sessions III Ruling 12 Sept 2007

AB 1493 is legal

Pg 46

“Plaintiffs’ expert Dr. Christy estimated that implementing the regulations across the entire United States would reduce global temperature by about $1/100^{\text{th}}$ (.01) of a degree by 2100. Hansen did not contradict that testimony.”

Spatial Area Footprint Electricity Generation

	On-demand?	W/m ²
Biomass Burn		0.5 - 0.6
Wind		0.5 - 1.5
Solar		4 - 10
Coal		100 - 1000
Natural Gas		200 - 2000
Nuclear		[2000]

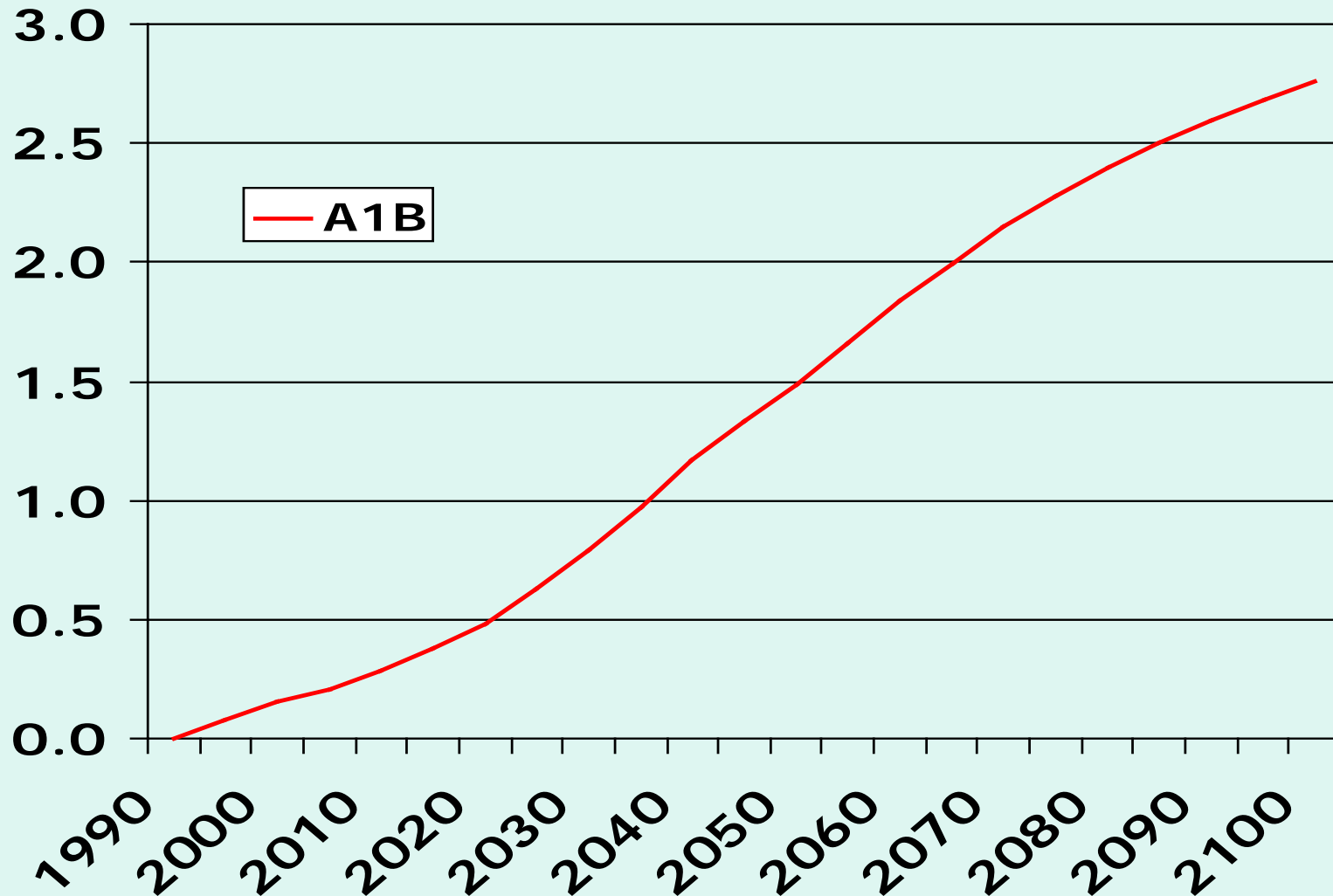
Questions

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- What would be the impact of building 1000 nuclear power plants and putting them on-line by 2020?
 - (average 1.4 gigawatt output each)

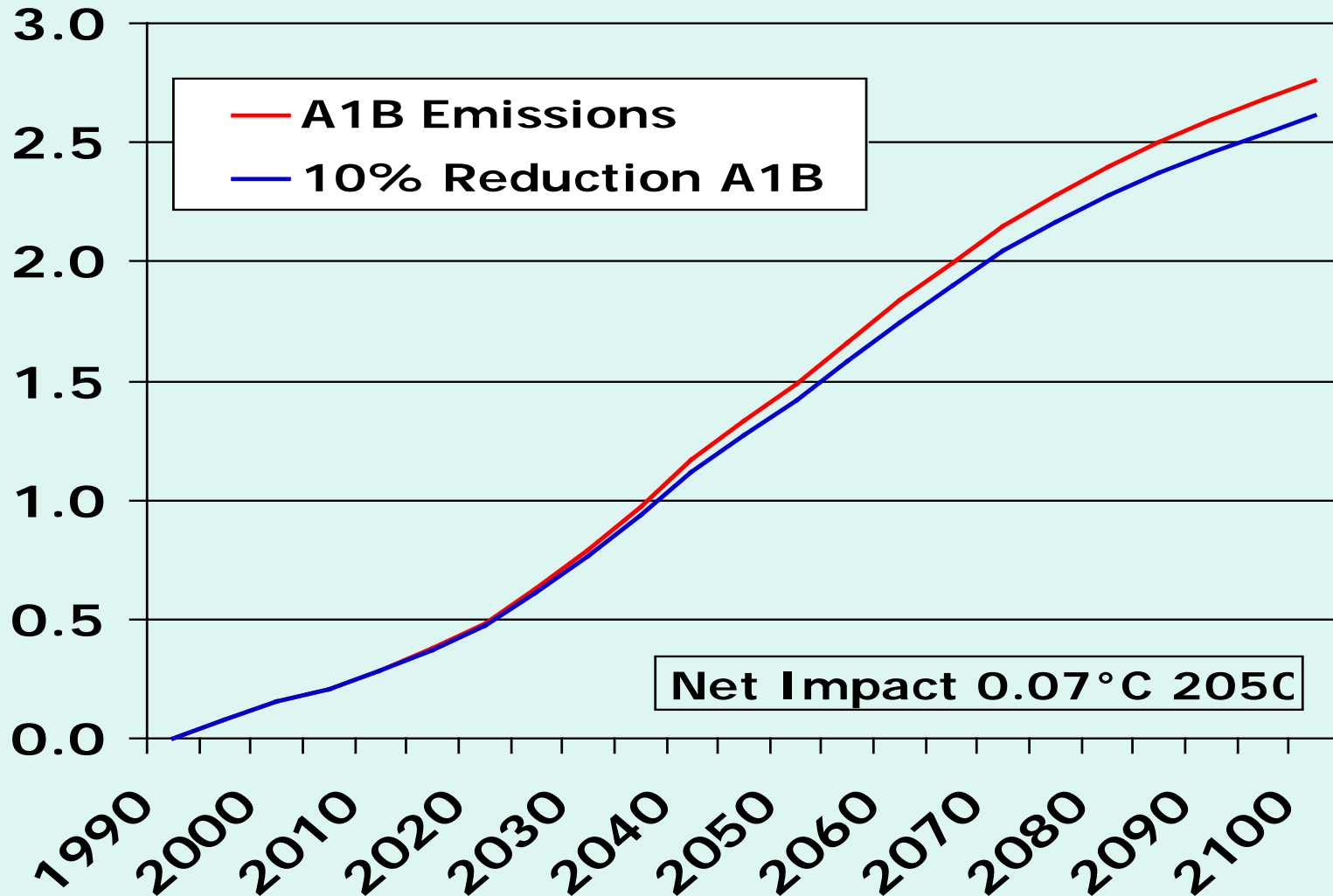
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IPCC "Best Estimate"



Net Effect of 10% CO₂ emission reduction to A1B Scenario (~1000 Nuclear Plants by 2020)



Main Points:

Without energy, life is brutal and short.

Proposed “do-something-about-global-warming” initiatives will not detectably alter whatever the climate is going to do.

Making energy more expensive is a regressive tax and an economic development inhibitor

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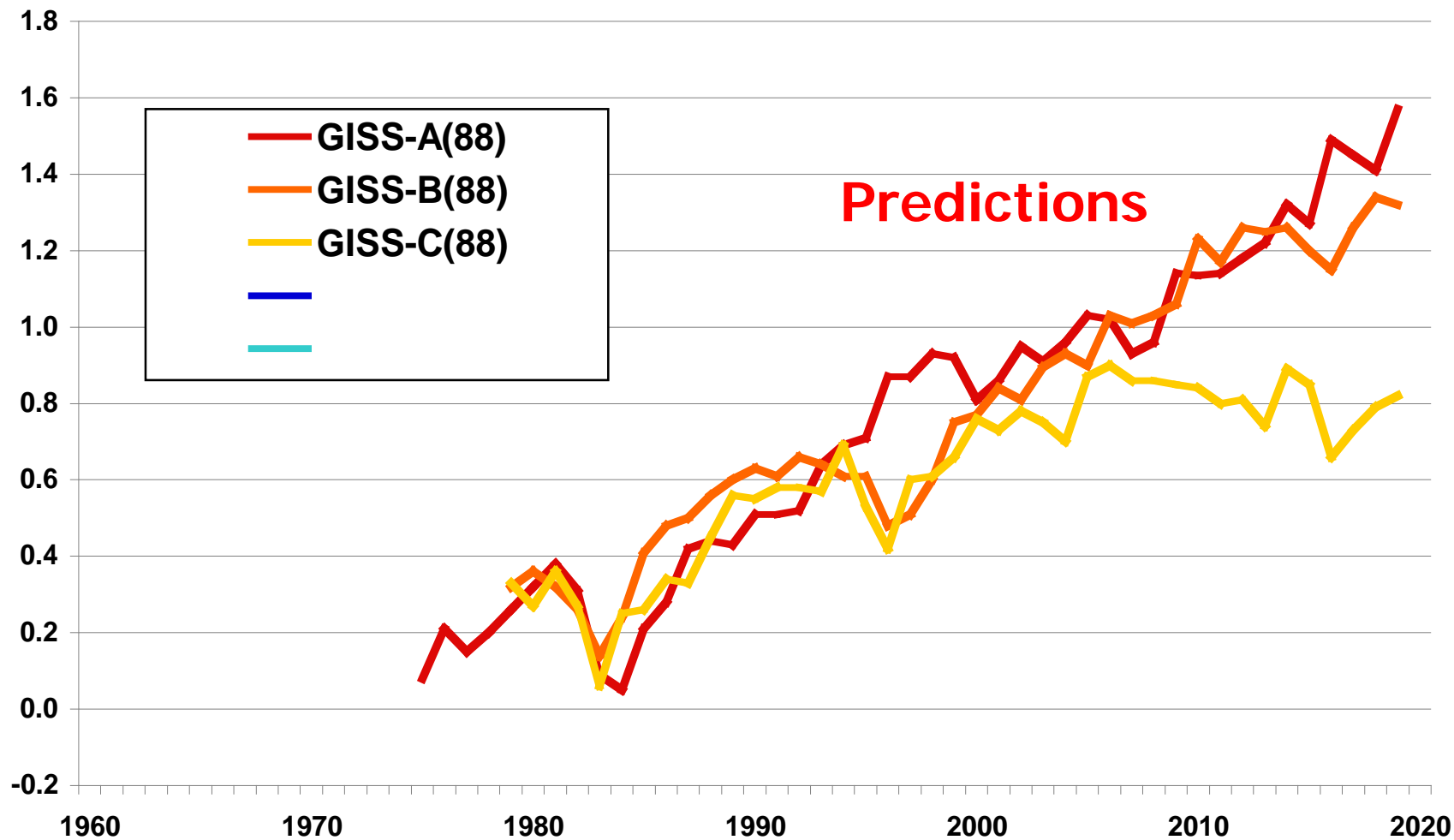
Proposed “do-something-about-global-warming” initiatives will not detectably alter whatever the climate is going to do.

Making energy more expensive is a regressive tax and stops economic development

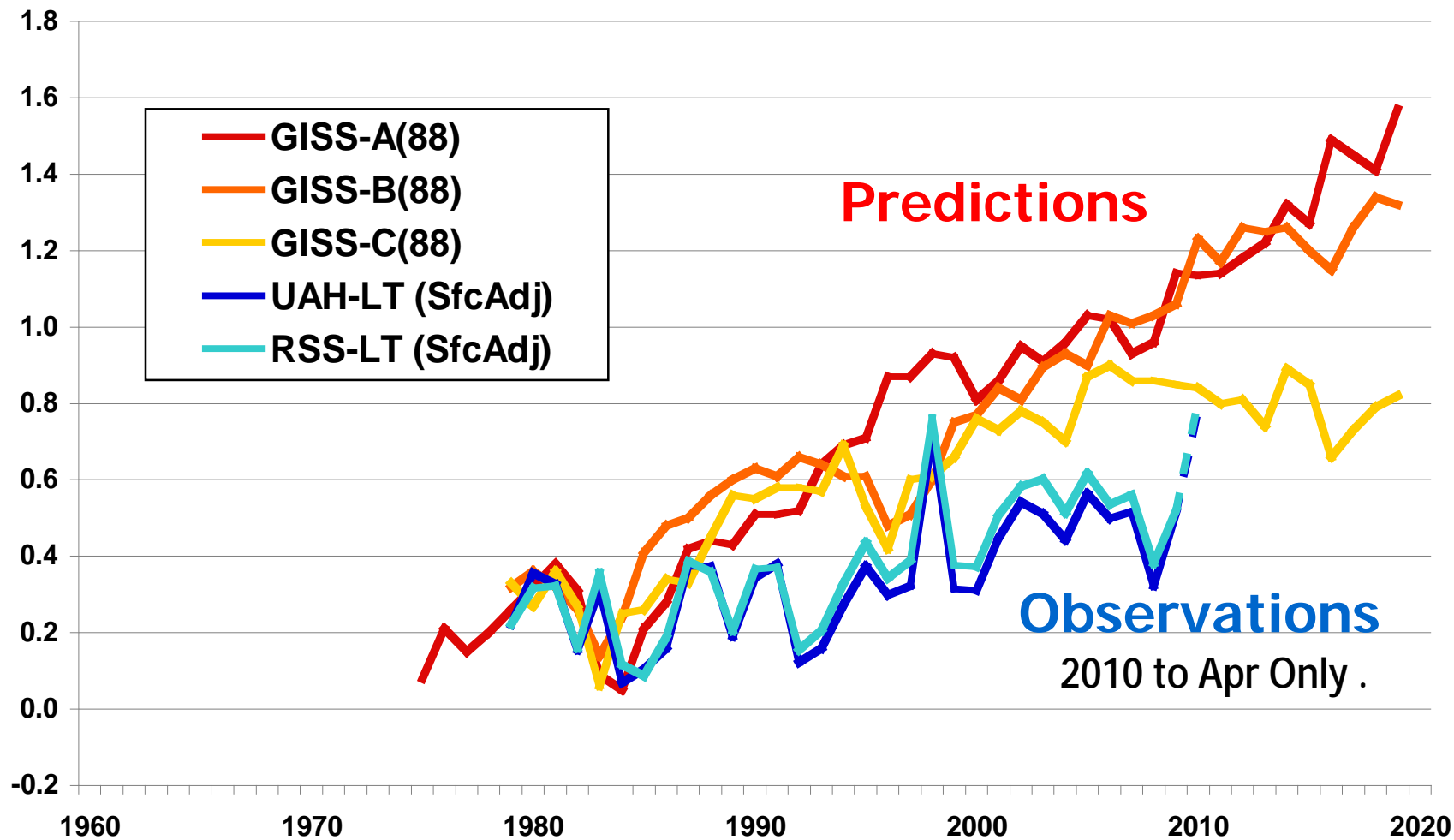
'We should always begin our scientific assessments with this statement, "At our present level of ignorance, we think we know ...' "

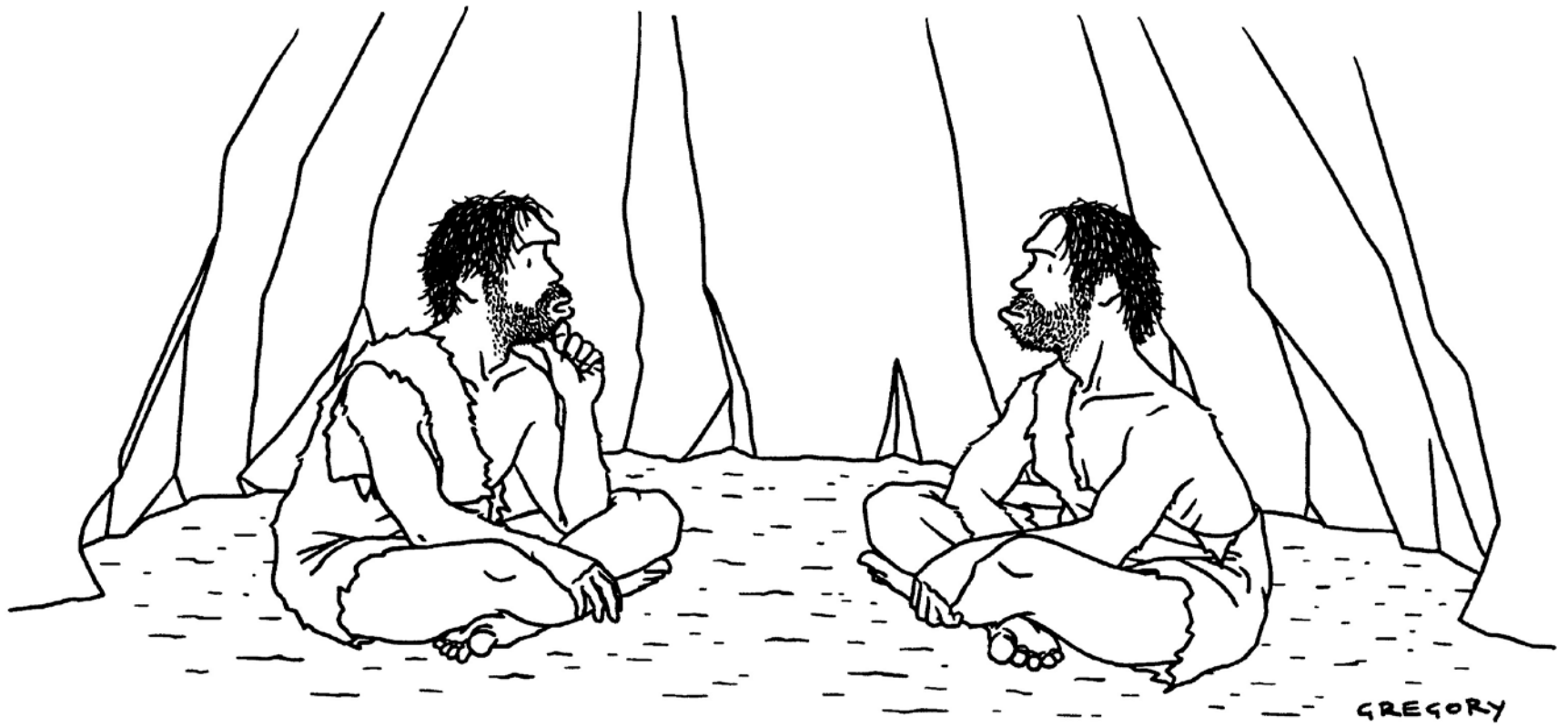
**Paraphrase of Mr. Richard Mallory
Physics Teacher
Hoover High School, Fresno CA
1969**

History Lesson 1988



History Lesson 1988





“Something’s just not right—our air is clean, our water is pure, we all get plenty of exercise, everything we eat is organic and free-range, and yet nobody lives past thirty.”