ICSF Irish Climate Science Forum

Thursday 21 January 2021

Testing Climate Claims
2021 Update

John R. Christy

Professor, Atmospheric and Earth Sciences

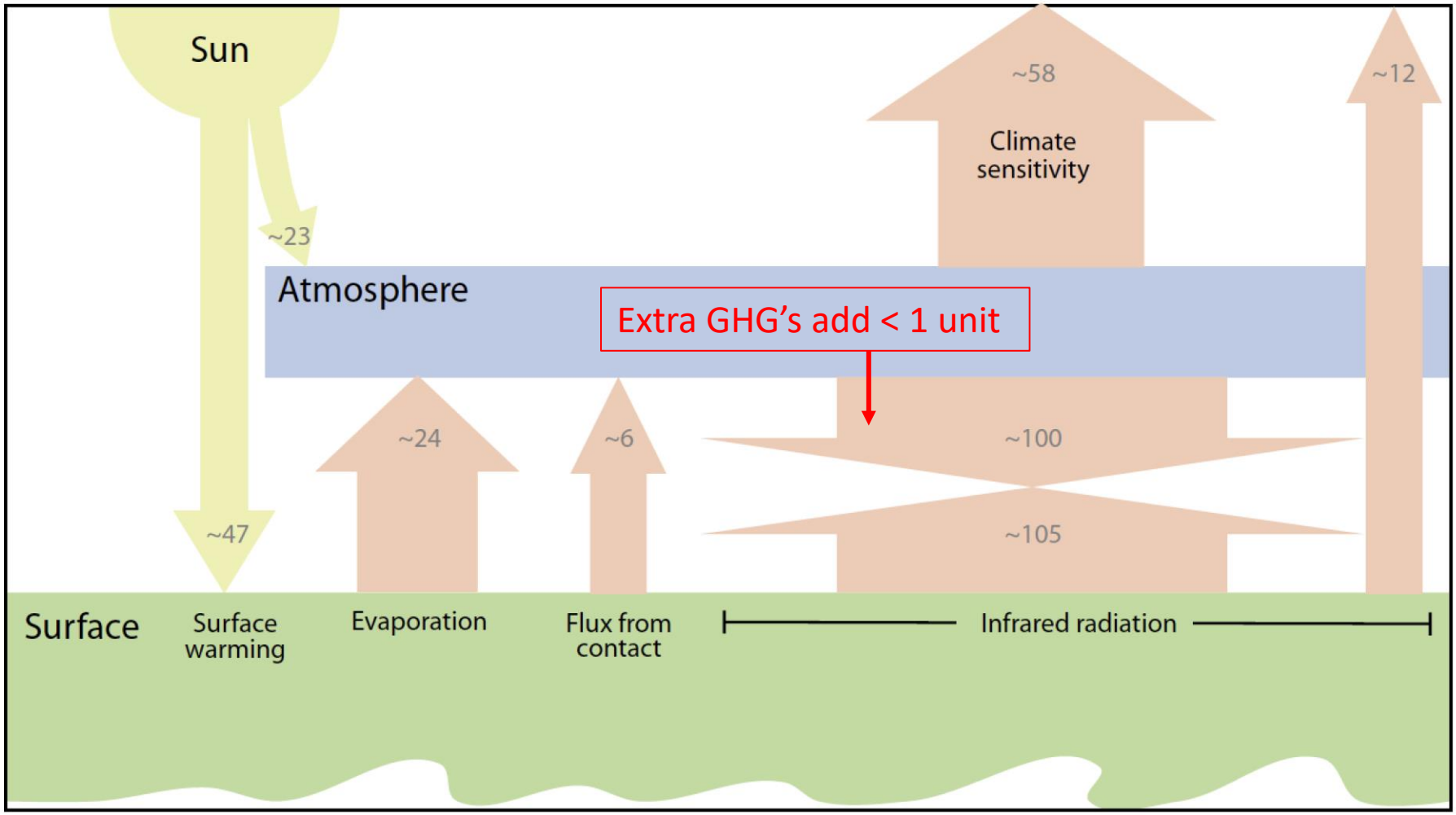
Director, Earth System Science Center

The University of Alabama in Huntsville

Dealing with Claims about Climate Change in 2021 can be extremely frustrating.

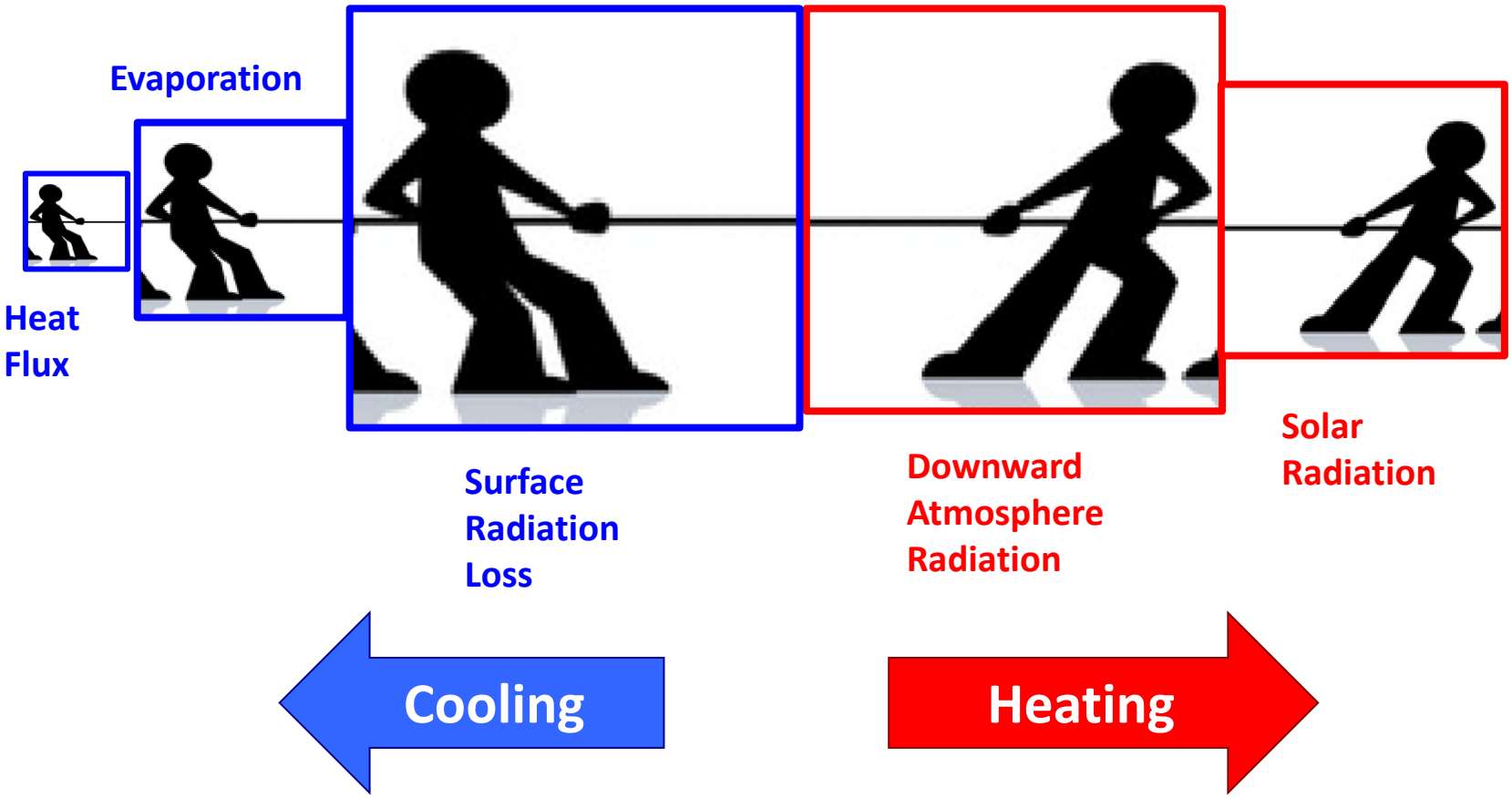
We'll look at some claims and test them with evidence to see if there is a "climate crisis."

The Theory of Greenhouse Warming – detecting a tiny influence on a massive climate system

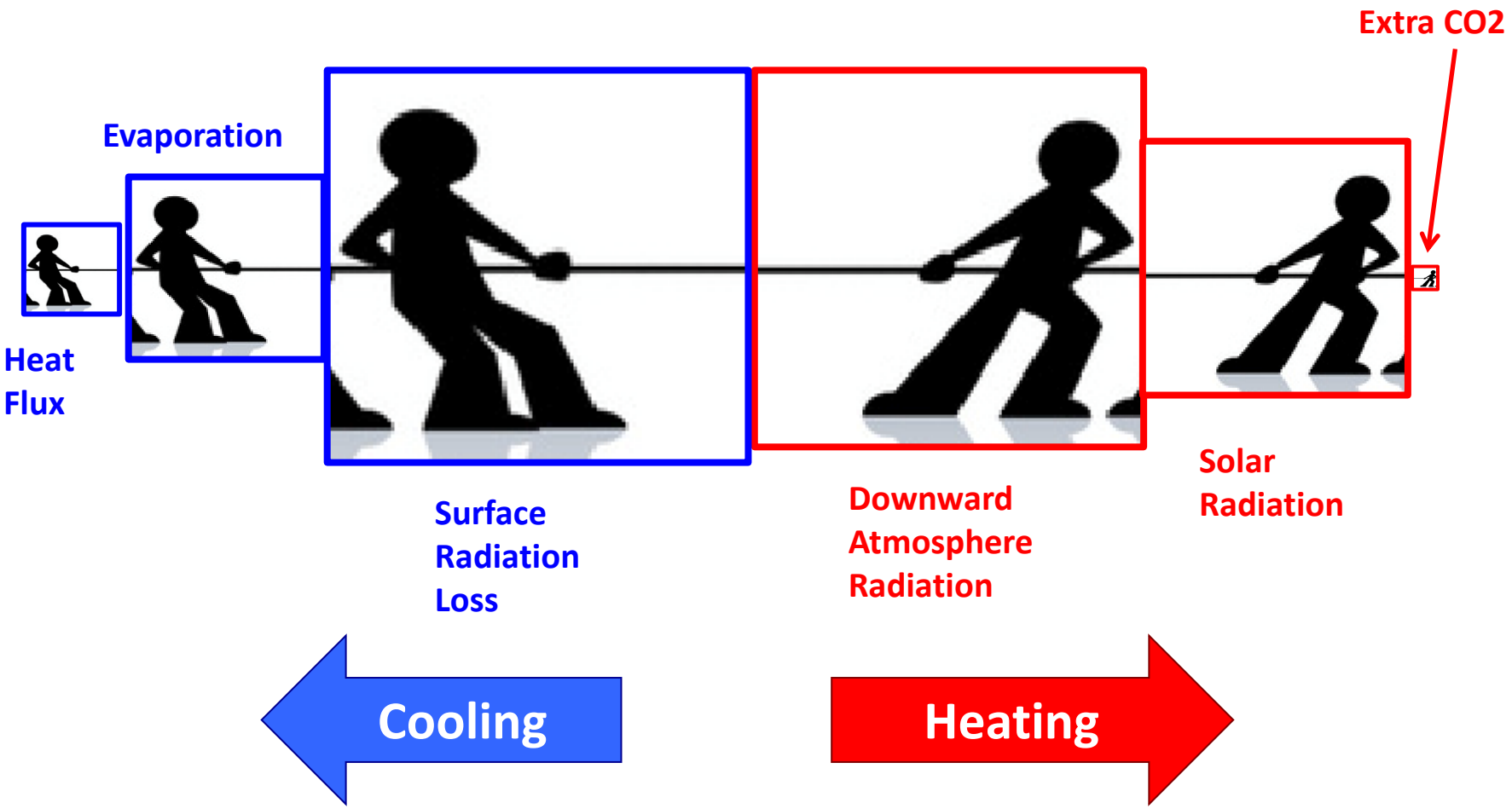


Earth System Energy Flow Rates (1 unit ~ 3.4 W m^{-2}) IPCC

What's happening at the surface?



What's happening at the surface?



How do we test a claim that current global warming is significant and that it is caused almost entirely by the extra greenhouse gases that human economies emit as they enhance their wellbeing?

To test the claim we must locate a test metric that has the following robust and scientifically defensible characteristics:

McKitrick and Christy (2018)

The metric should have these characteristics:

The response is seen in all models as a dominate characteristic

Response is not there when extra greenhouse gases are not included (i.e. control and experiment are always different)

The metric cannot have been used in the tuning and development of the model

Observations should come from multiple, independent sources

The metric should have these characteristics:

The response is seen in all models as a dominate characteristic

Response is not there when extra greenhouse gases are not included (i.e. control and experiment are always different)

The metric cannot have been used in the tuning and development of the model

Observations should come from multiple, independent sources

The metric should have these characteristics:

The response is seen in all models as a dominate characteristic

Response is not there when extra greenhouse gases are not included (i.e. control and experiment are always different)

The metric cannot have been used in the tuning and development of the model

Observations should come from multiple, independent sources

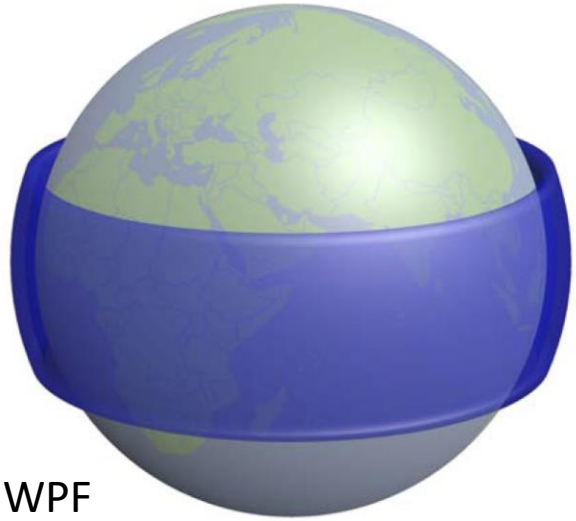
The metric should have these characteristics:

The response is seen in all models as a dominate characteristic

Response is not there when extra greenhouse gases are not included (i.e. control and experiment are always different)

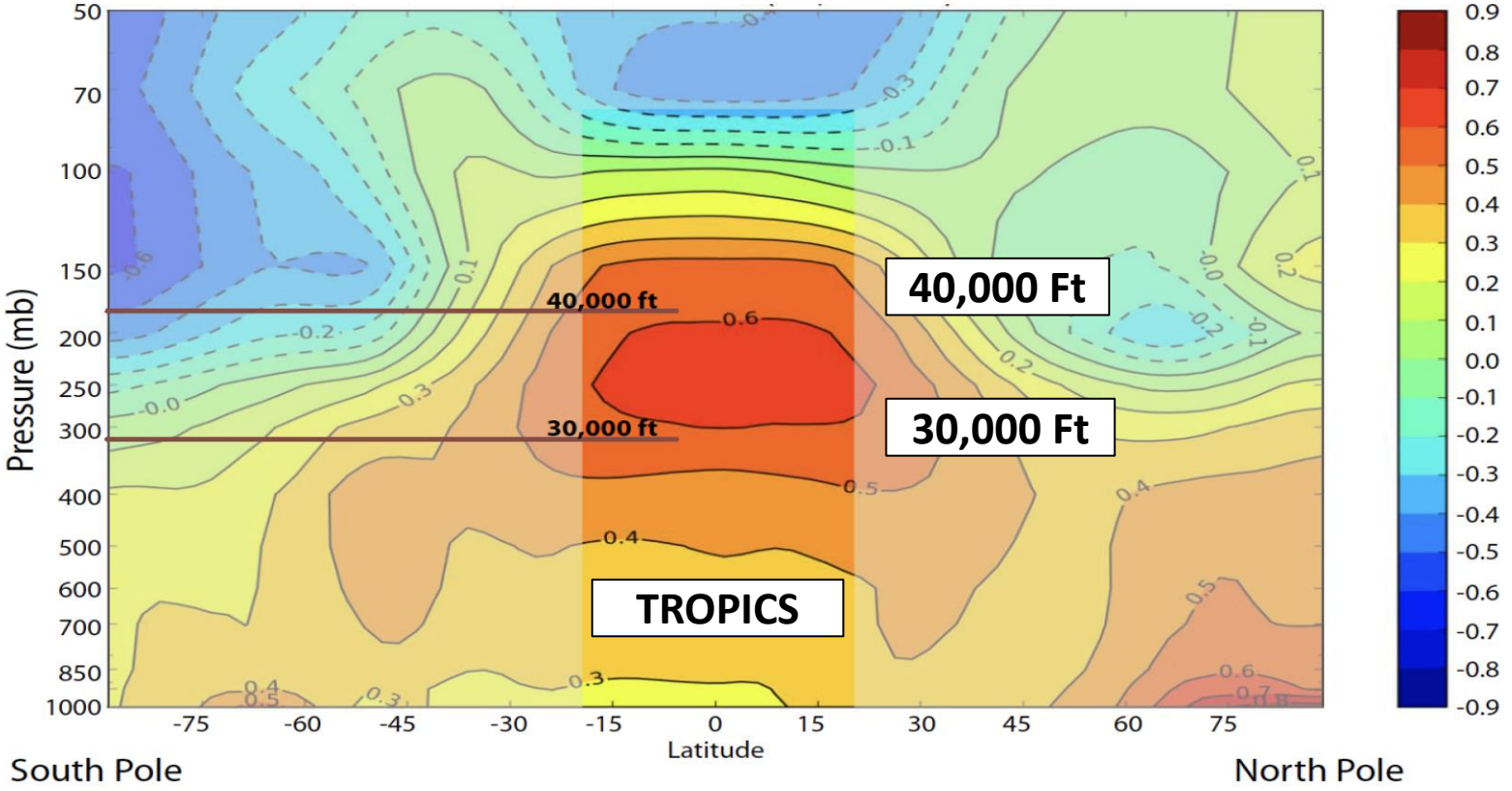
The metric cannot have been used in the tuning and development of the model

Observations should come from multiple, independent sources



GWPF

Test Metric: Temperature, Tropical upper troposphere 300-200 hPa (~30k-40k ft)



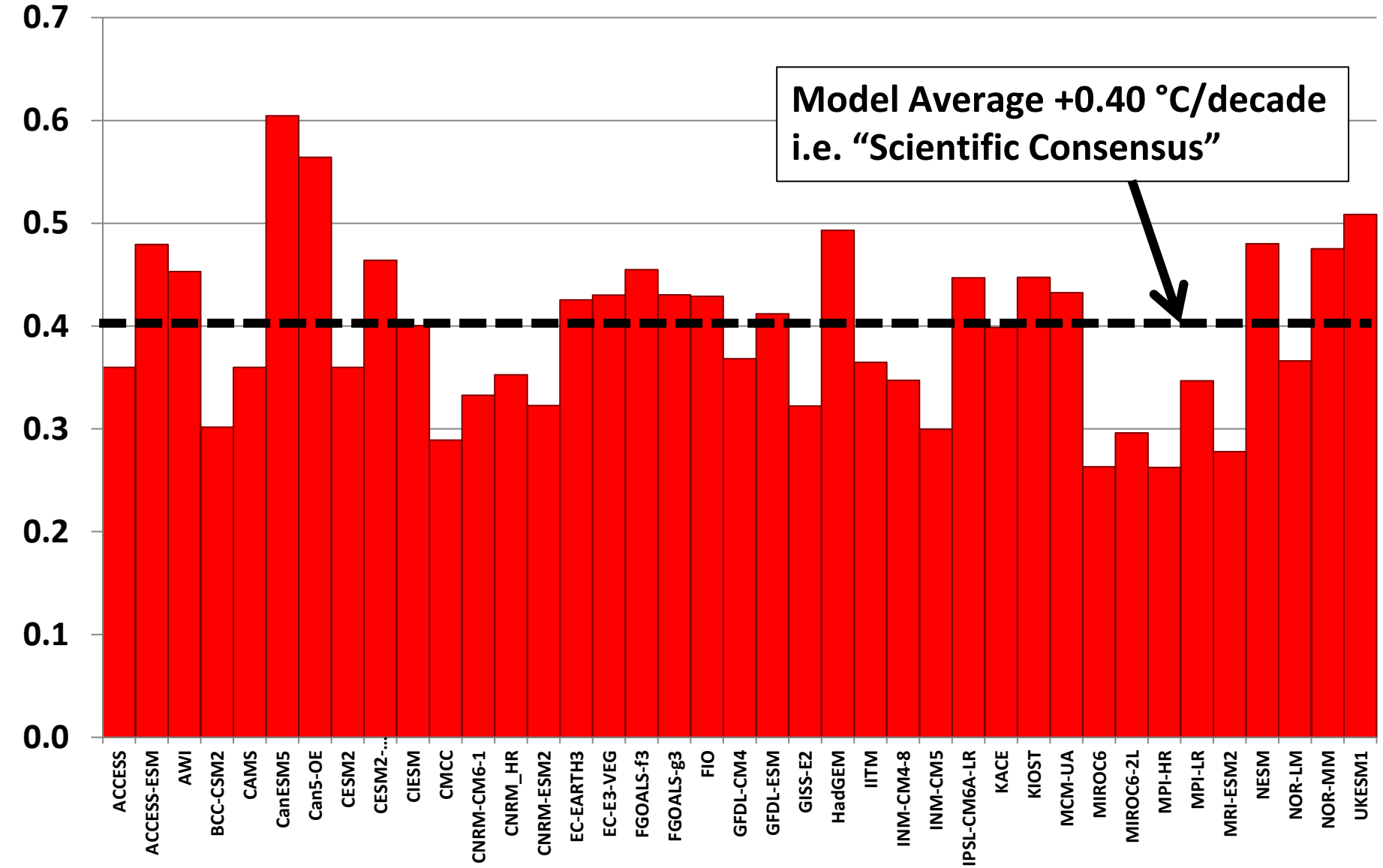
Canadian Model

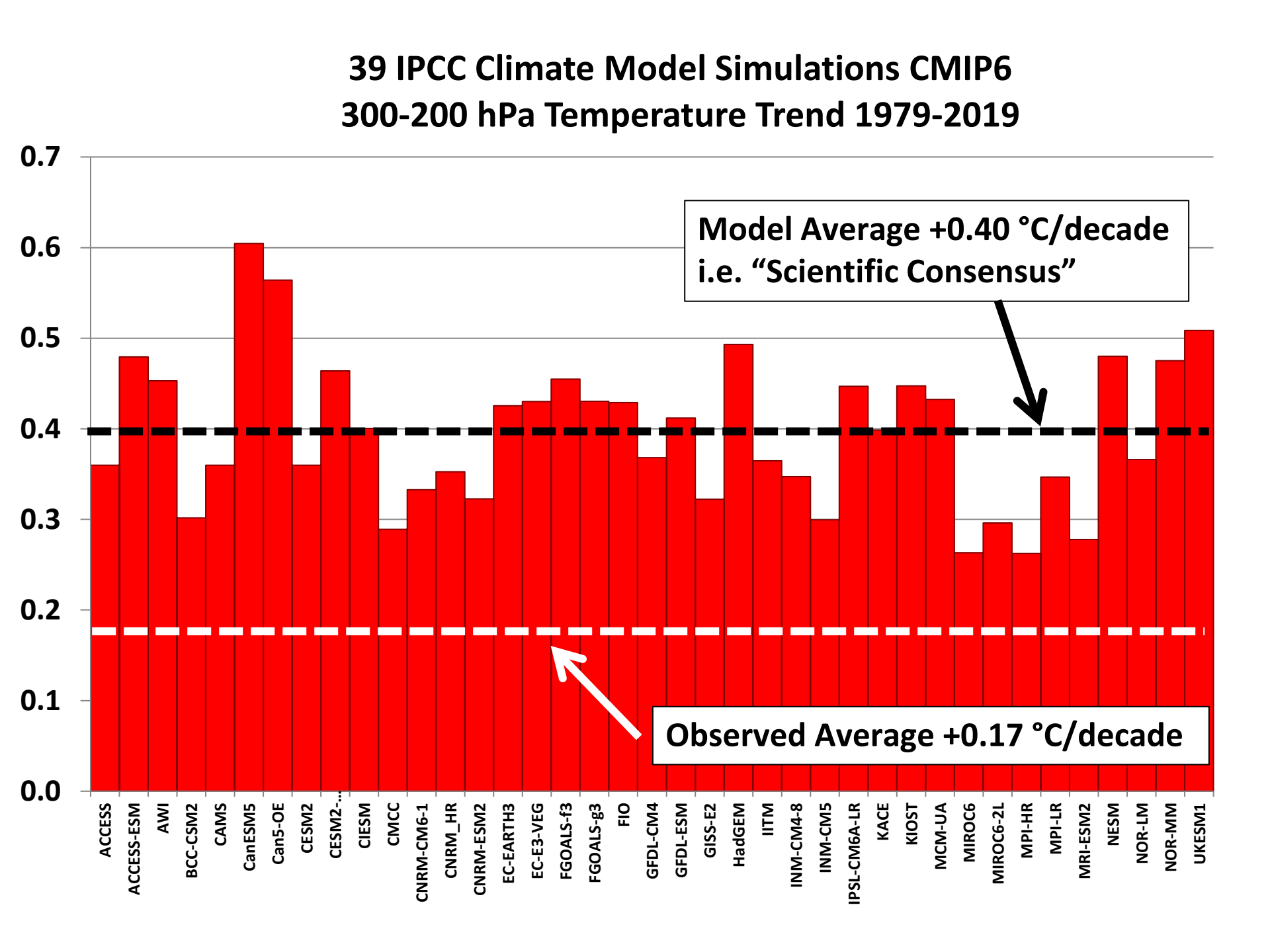
Trends 1979-2018

How does the claim relate to what "should" be happening in the upper atmosphere in the tropics?

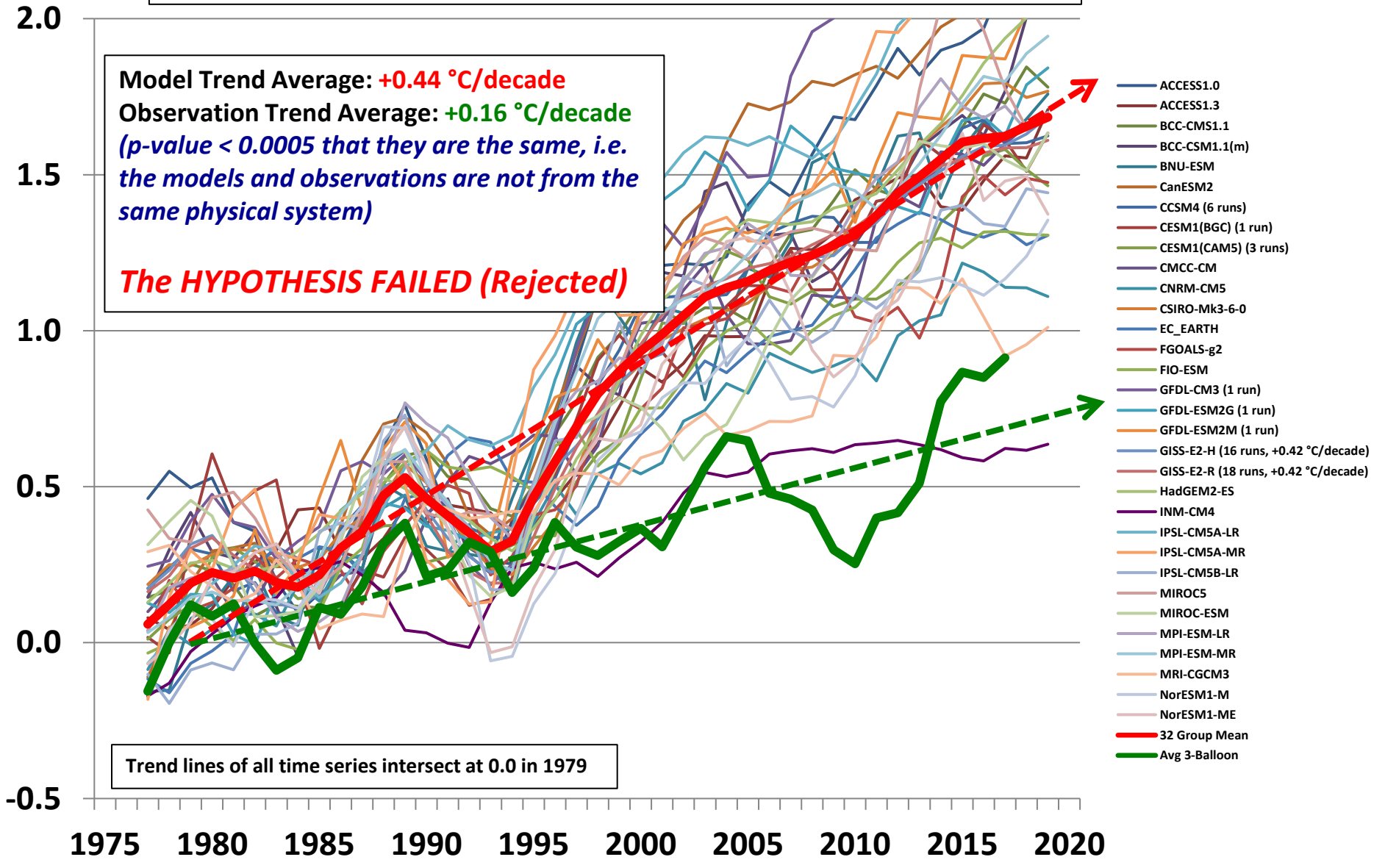
Claim (or hypothesis): significant warming should have *already* occurred here to change our climate.

39 IPCC Climate Model Simulations CMIP6
300-200 hPa Temperature Trend 1979-2019

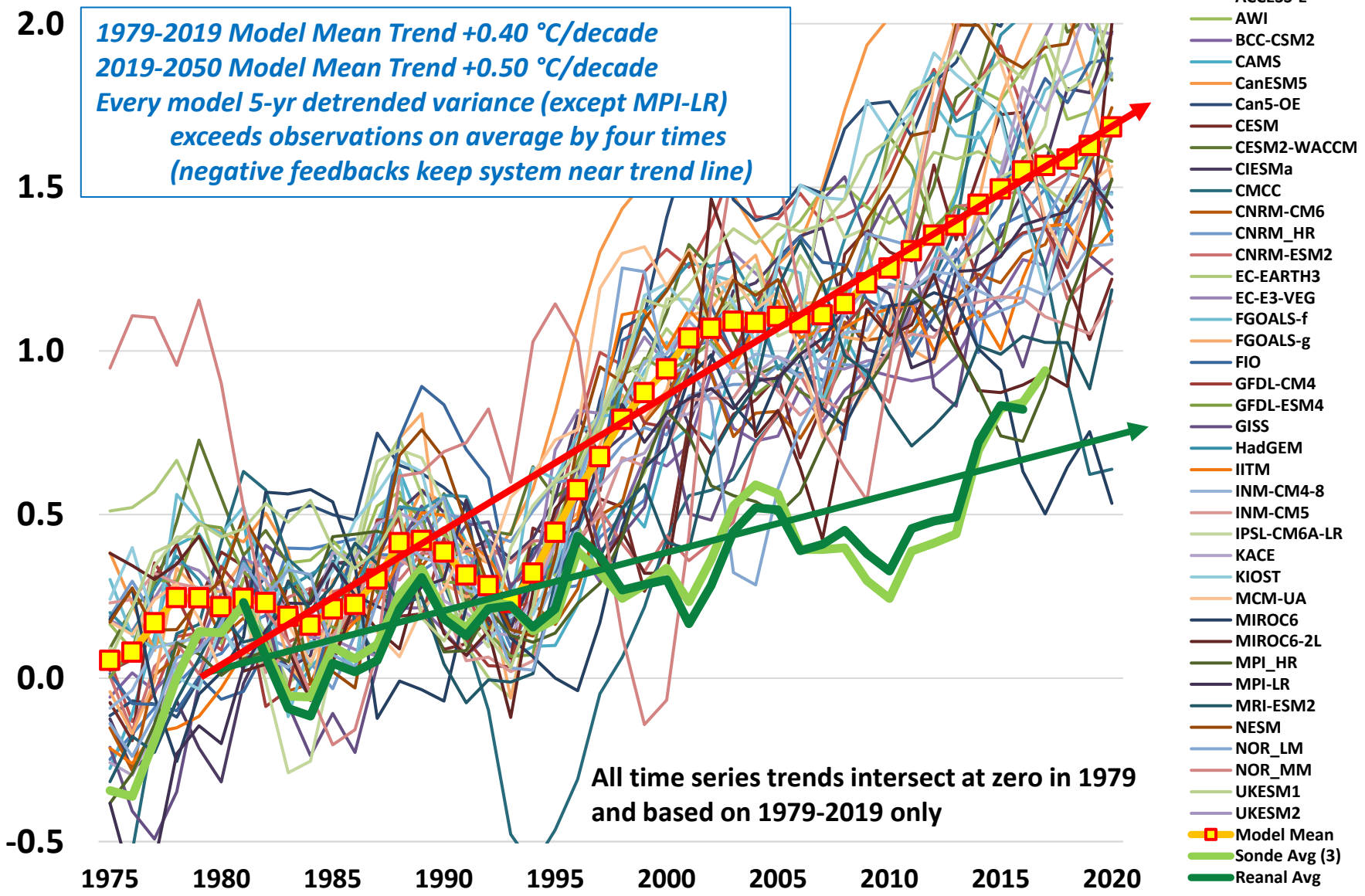



39 IPCC Climate Model Simulations CMIP6
300-200 hPa Temperature Trend 1979-2019
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Model Average +0.40 °C/decade
i.e. "Scientific Consensus"
Observed Average +0.17 °C/decade
ACCESS
ACCESS-ESM
AWI
BCC-CSM2
CAMS
CanESM5
Can5-OE
CESM2
CESM2-...
CIESM
CMCC
CNRM-CM6-1
CNRM_HR
CNRM-ESM2
EC-EARTH3
EC-E3-VEG
FGOALS-f3
FGOALS-g3
FIO
GFDL-CM4
GFDL-ESM
GISS-E2
HadGEM
IITM
INM-CM4-8
INM-CM5
IPSL-CM6A-LR
KACE
KIOST
MCM-UA
MIROC6
MIROC6-2L
MPI-HR
MPI-LR
MRI-ESM2
NESM
NOR-LM
NOR-MM
UKESM1

5-Year Running Mean of Tropical Temperature CMIP5 Anomalies of 300-200 hPa Layer (1979-2019)



5-yr Running mean 300-200hPa Tropical Temperature Anomalies
CMIP-6 (Historical + ssp245 after 2014)

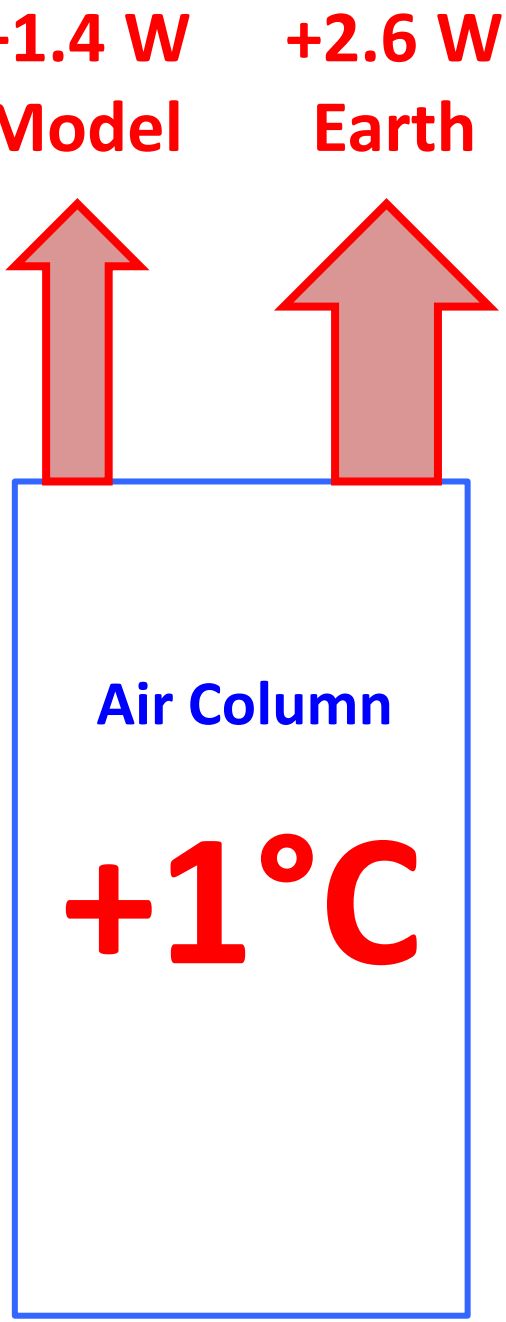


John R. Christy, The University of Alabama in Huntsville

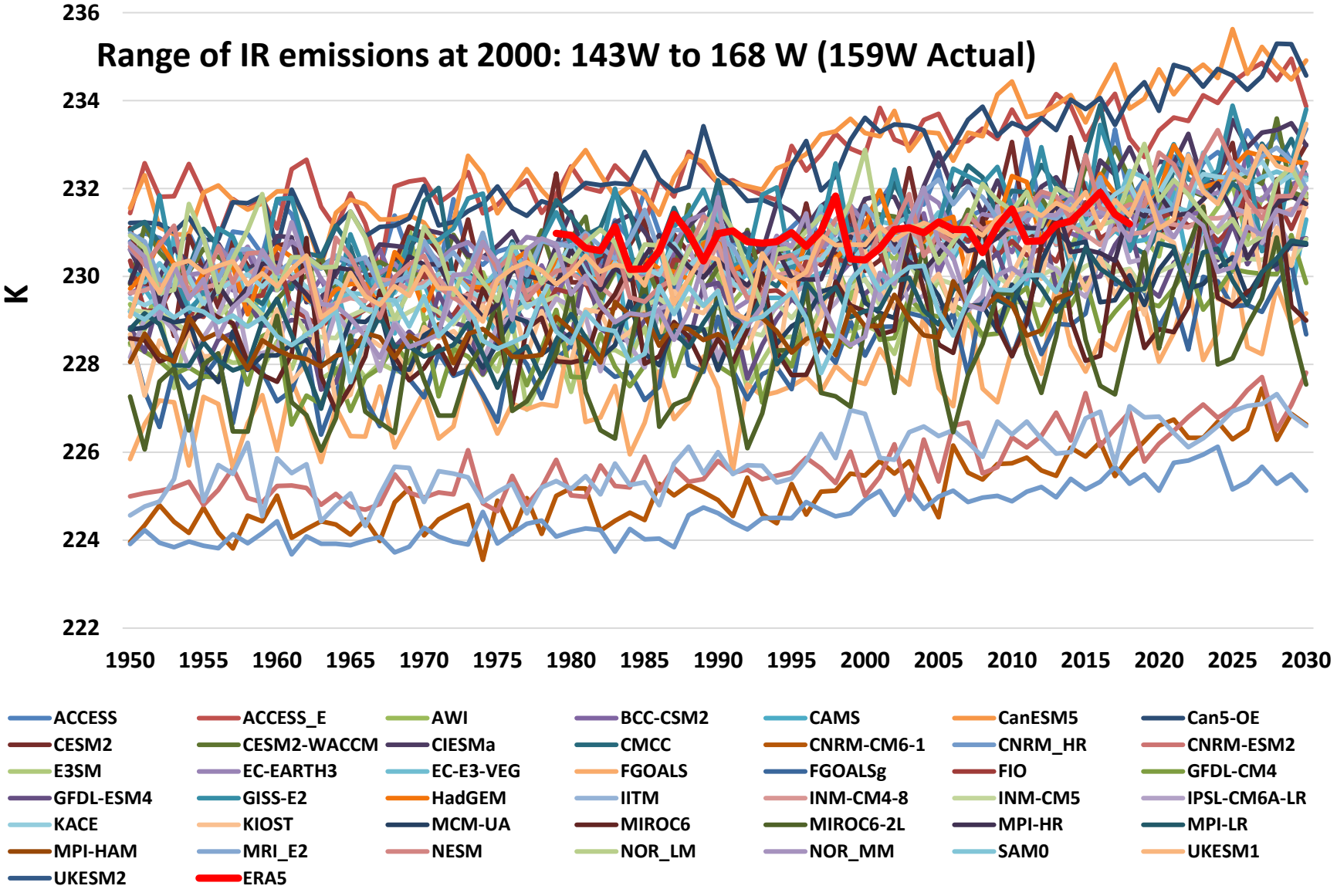
Why do models warm too fast, and vary more wildly than observations?

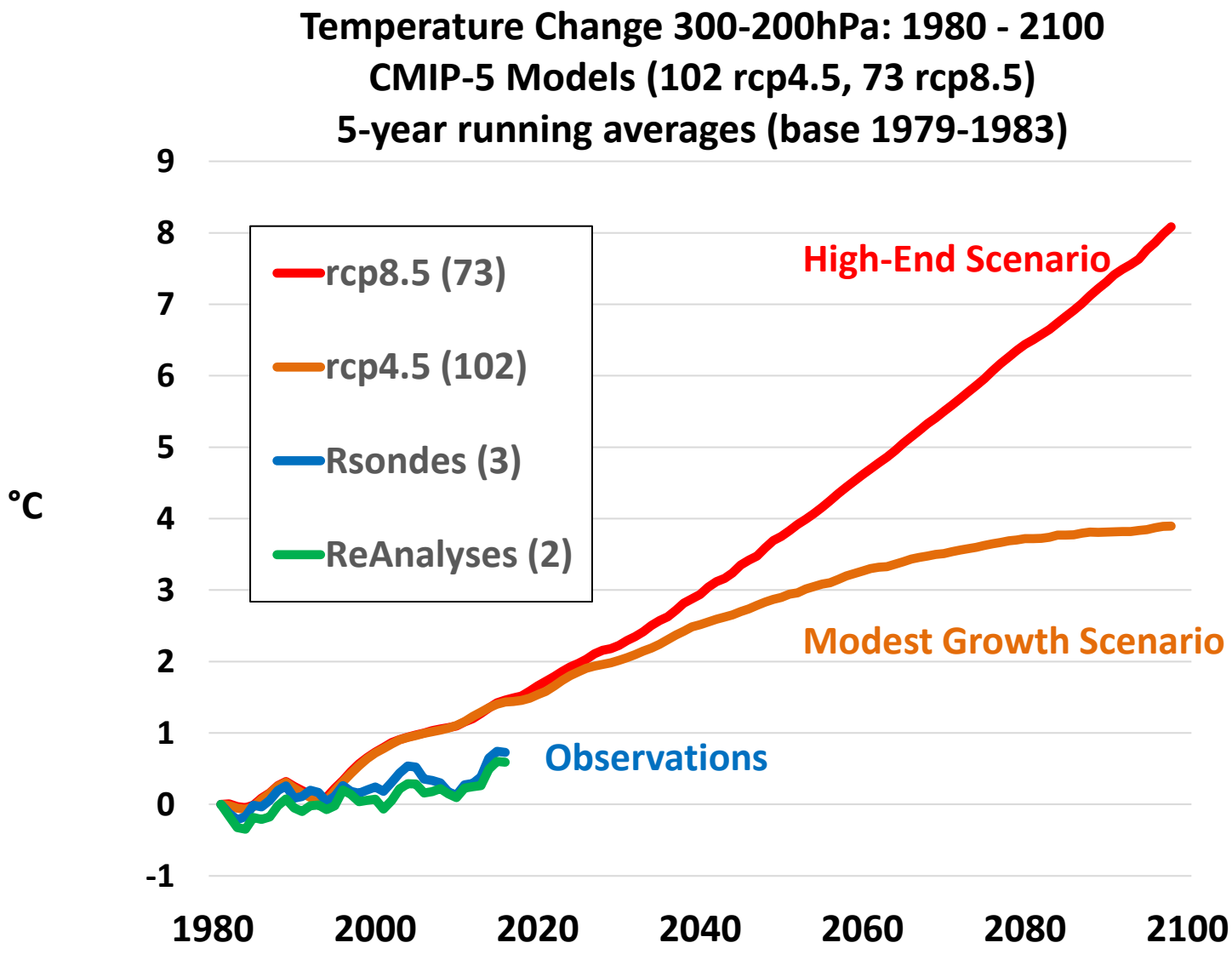
Likely related to model processes which do not allow enough heat to escape to space (negative feedback) when warming events occur. This is likely related to the distribution of heat trapping clouds and/or water vapor. **Roy Spencer UAH**

Thus, the flow of energy is misrepresented in these hypotheses we call models



Absolute Temperature 300-200 hPa




Temperature Change 300-200hPa: 1980 - 2100
CMIP-5 Models (102 rcp4.5, 73 rcp8.5)
5-year running averages (base 1979-1983)
°C
9
8
7
6
5
4
3
2
1
0
-1
1980
2000
2020
2040
2060
2080
2100
rcp8.5 (73)
rcp4.5 (102)
Rsondes (3)
ReAnalyses (2)
High-End Scenario
Modest Growth Scenario
Observations

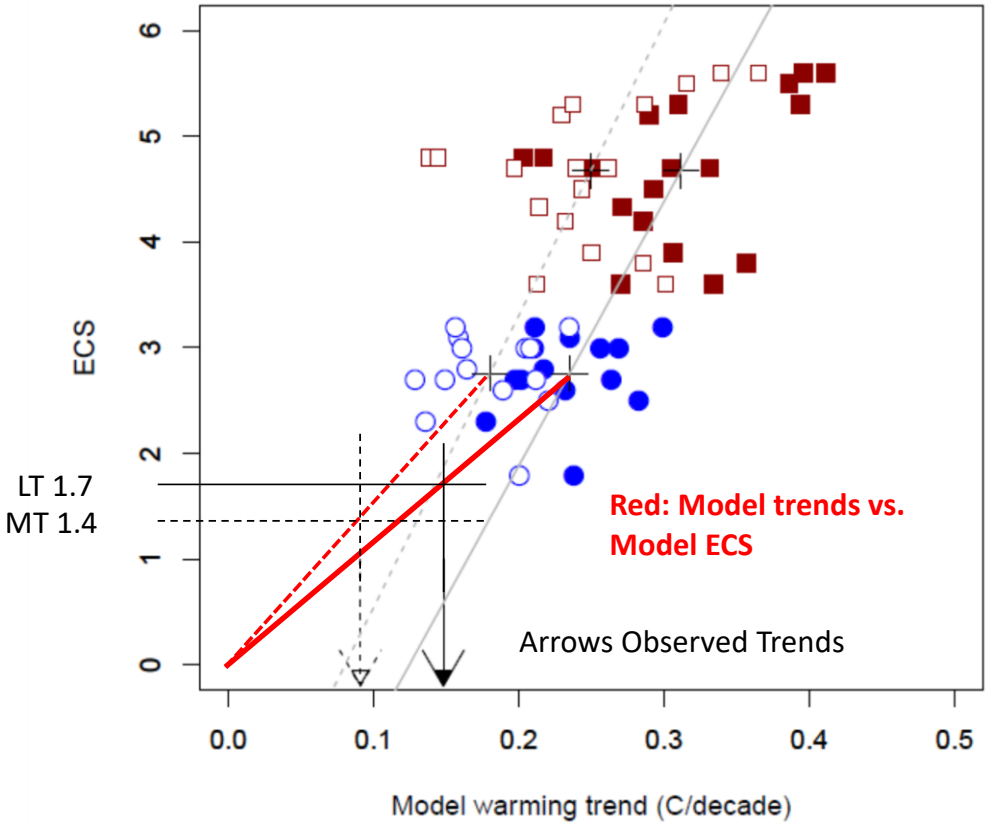
Equilibrium Climate Sensitivity or ECS, is an index-temperature that allegedly indicates the temperature of the globe after an instantaneous doubling of CO2.

Latest guestimates from models are 1.8 to 5.6 °C. That is a huge range, so modelers came up with an idea, *Emergent Constraint*, to figure out what the real ECS is.

By the way, Empirical (i.e. using real data) estimates of ECS are 1.0 to 2.3 °C, i.e. about half.

Emergent Constraint – a strange term that simply means there are characteristics in the climate system that are somewhat correlated with ECS. For example, if cloud amount is correlated with ECS (ECS is known in models), then cloud amount can be an Emergent Constraint. Thus a model with cloud amounts that are realistic would presumably have a realistic ECS. It's a rather round-about way to use tangential metrics to determine which model might have the best ECS when other, more obvious metrics are available.

McKitrick and Christy 2020 used an obvious metric for the Emergent Constraint – the temperature trend of the bulk atmosphere.



Emergent Constraint

Figure 4. Model ECS values plotted against model warming trends. Red squares: high ECS grou
Blue circles: low ECS group. Open shape: MT trend, closed shape: LT trend. Inverted triangle
mean observed LT trend (solid), mean observed MT trend (open).

This plot shows the relationship between global atmospheric trends (Emergent Constraint) and ECS from the models. The actual global trends (dashed arrows for mid-troposphere, solid for lower troposphere) suggest the ECS is around 1.4 to 1.7 °C – below the range of the CMIP-6 models. This implies models are too sensitive to greenhouse gases.

Models represent the level of understanding (or misunderstanding) scientists have about the impact of extra greenhouse gases on the climate. As Hypotheses, do they succeed in describing the attributes of the physical climate so well as to Determine Policy?

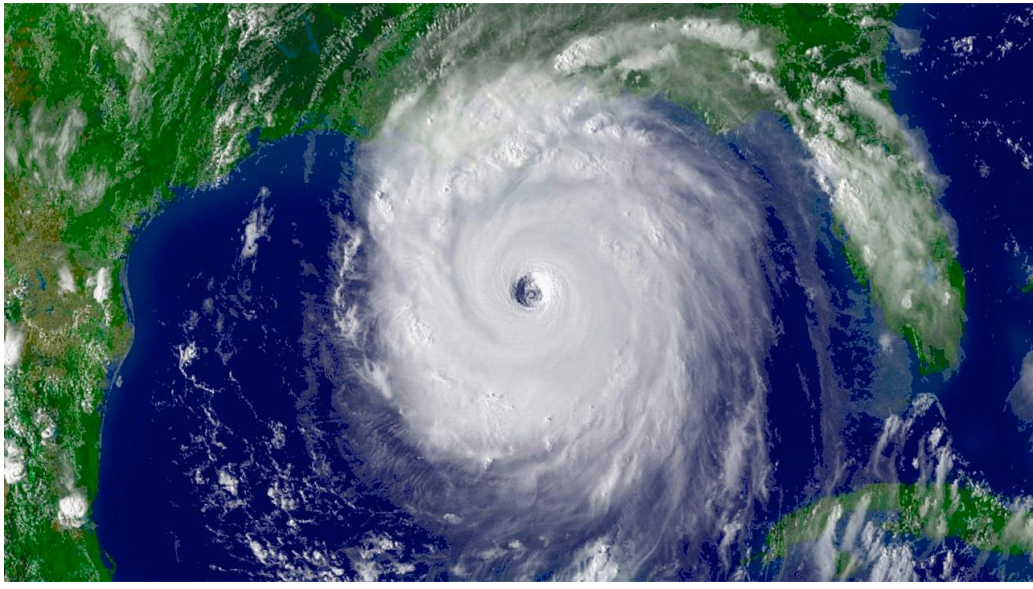
Models fail to reproduce the past

Models fail to reproduce accurate energy flows

Models disagree with each other about the future

The weather people really care about is not becoming more extreme or dangerous (and, people are getting smarter every day in dealing with weather problems).

Claim: All Extreme Weather is getting worse (and it's your fault)



CBS NEWS

The record-shattering 2020 hurricane season, explained

The Washington Post
Democracy Dies in Darkness

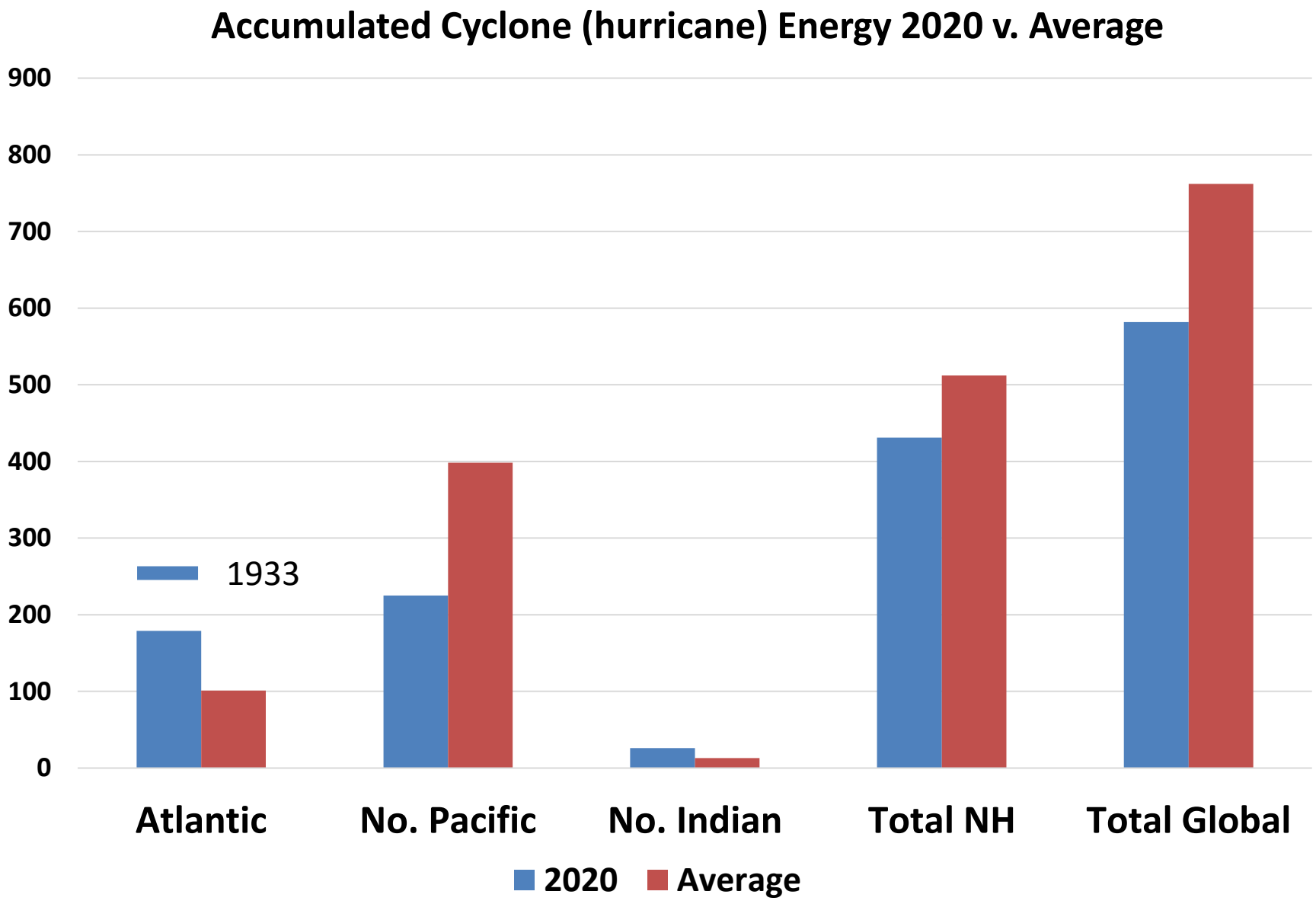
2020 Atlantic hurricane season breaks all-time record while leaving Gulf Coast battered

Search | US edition

The Guardian

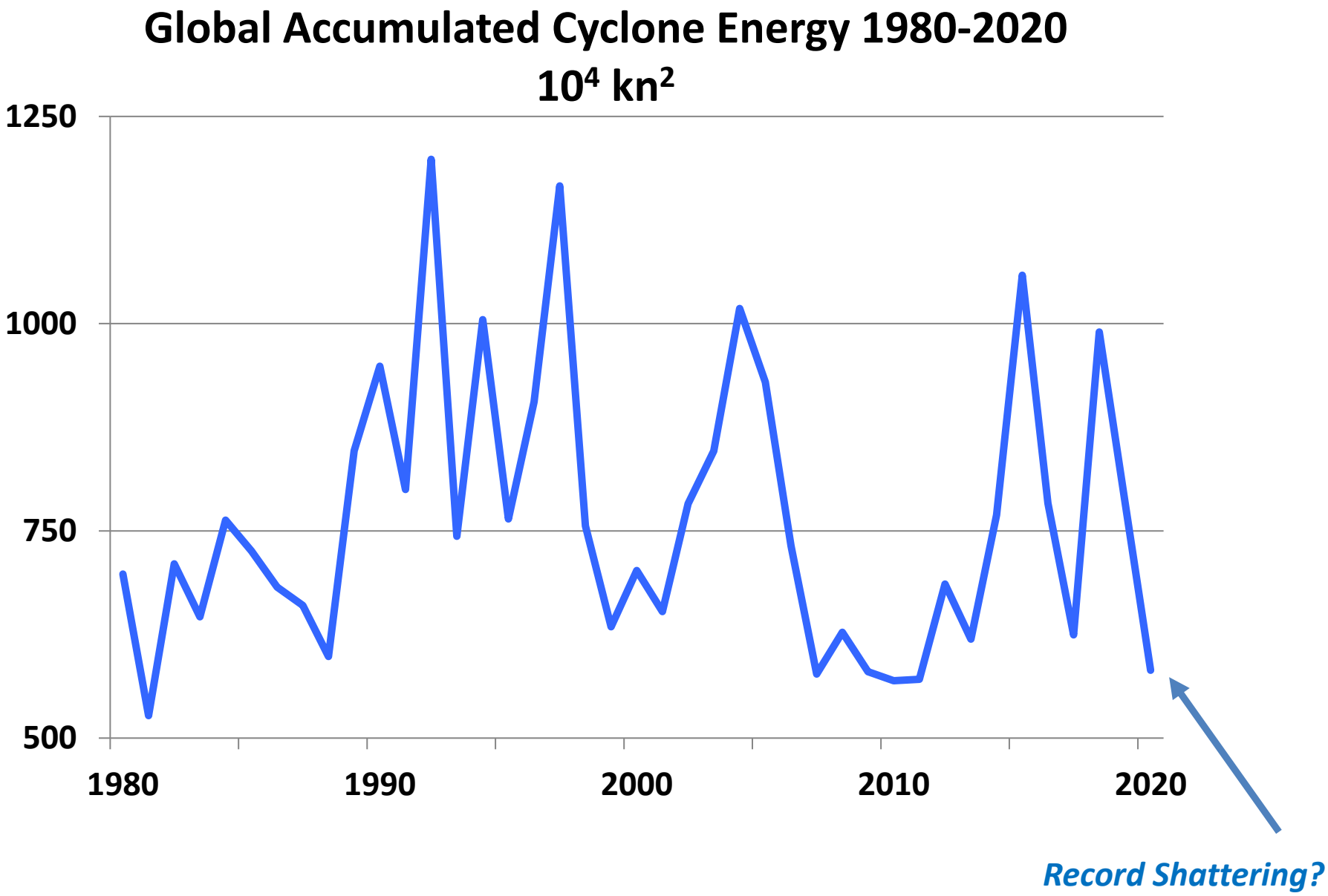
Devastating 2020 Atlantic hurricane season breaks all records

Dozens of people have died this year as Theta becomes 29th major storm

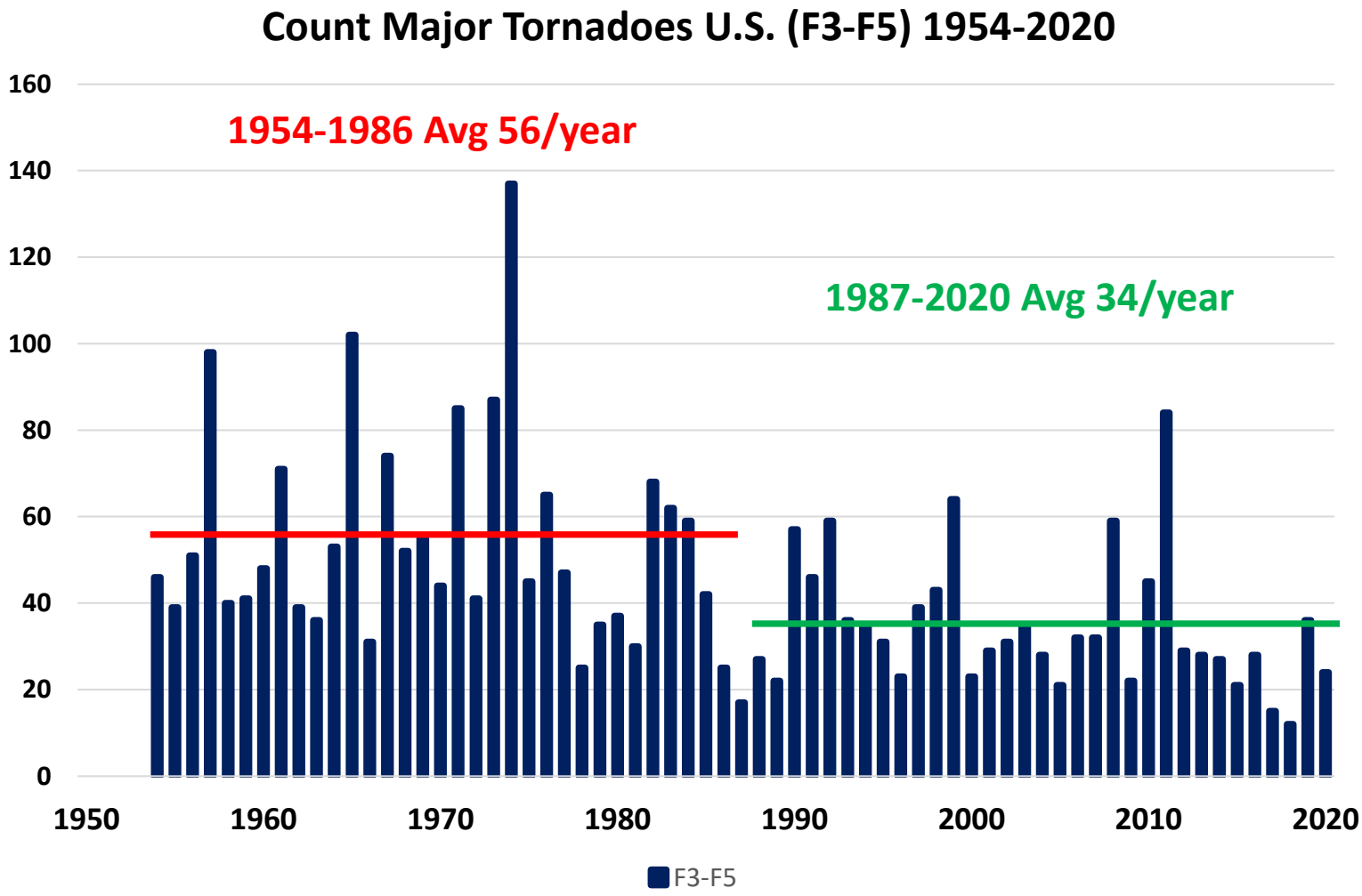


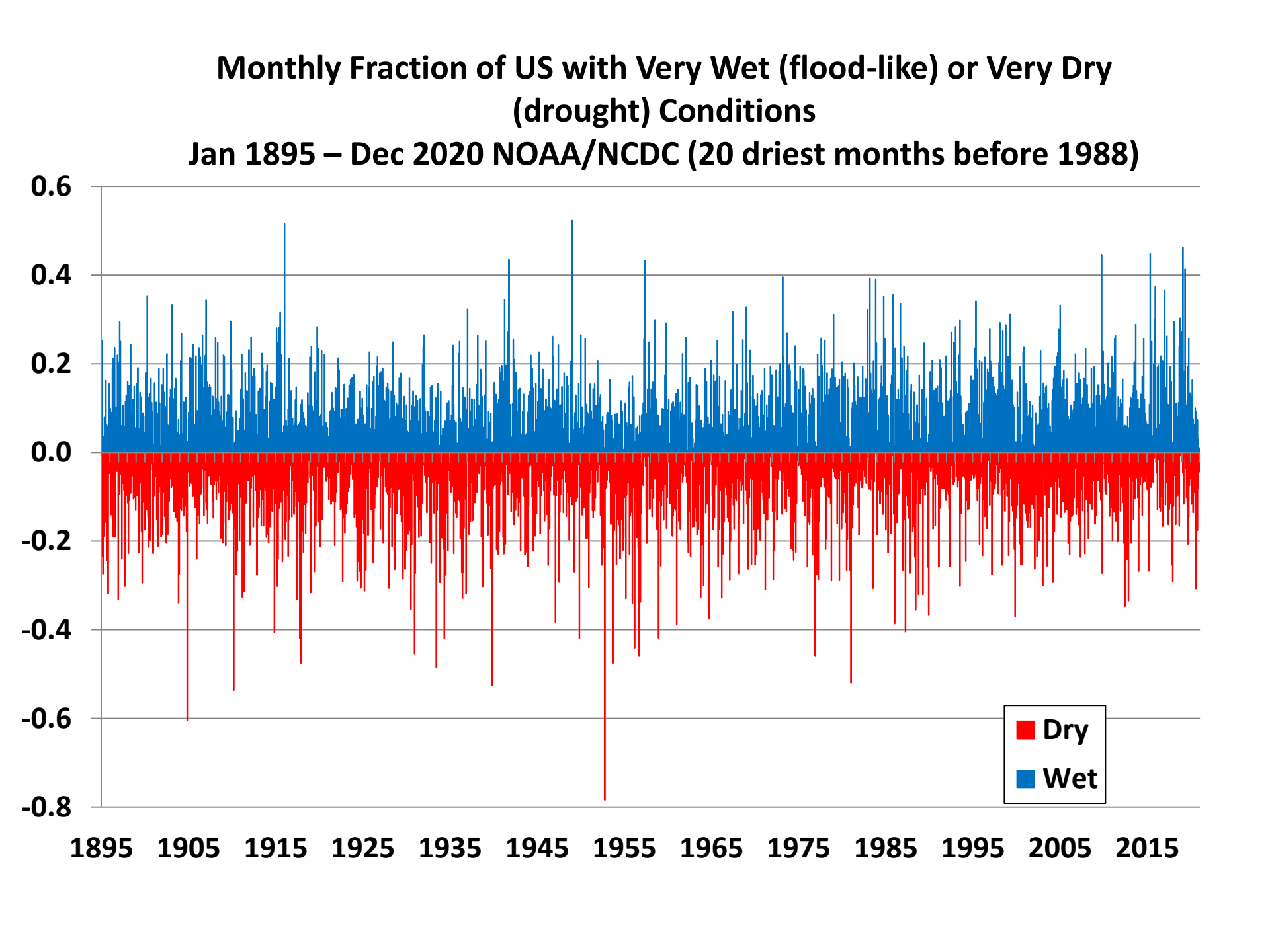
1933 experienced 35% more ACE than 2020

Klotzbach Colorado St. Univ.

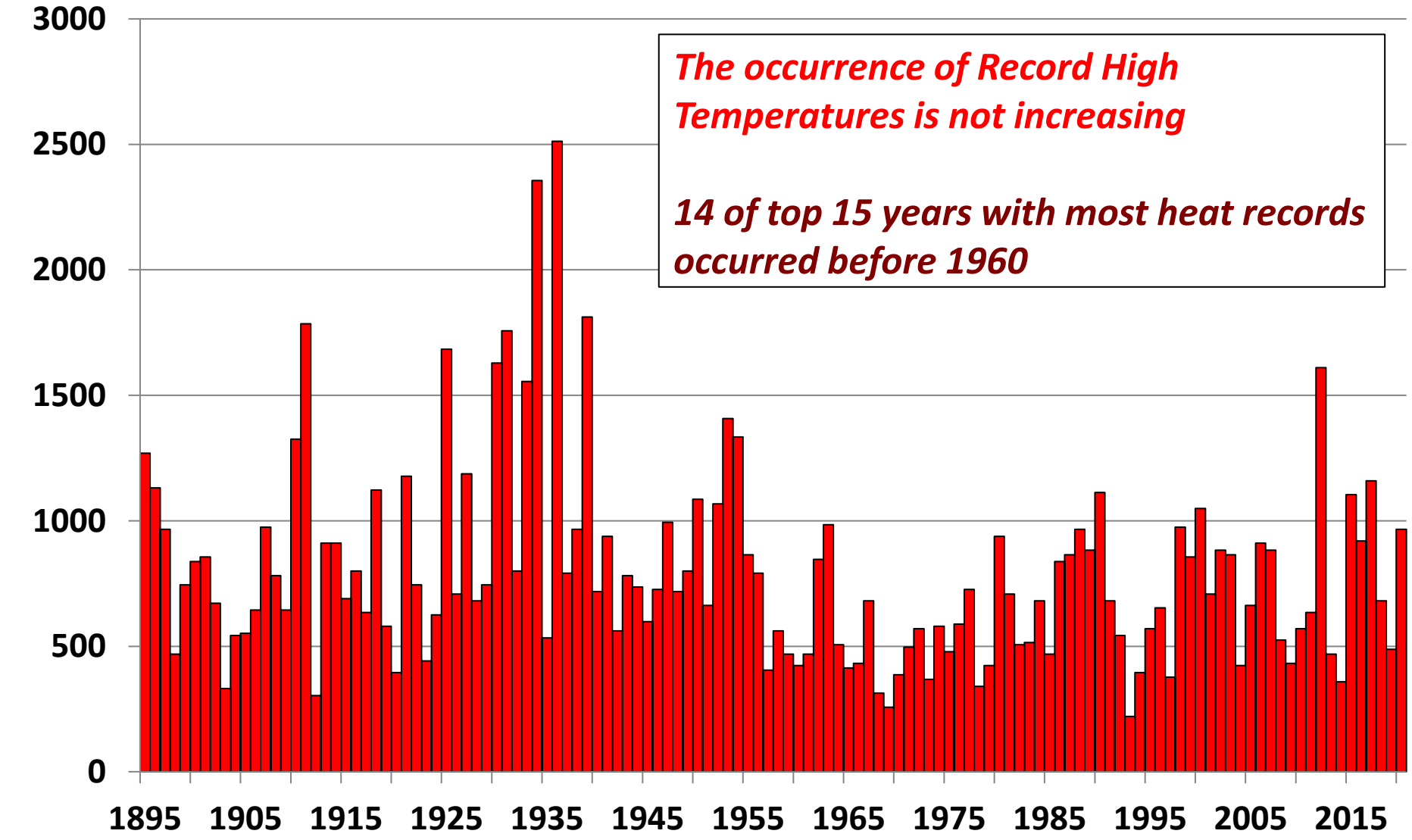


Klotzbach Col State Univ


Count Major Tornadoes U.S. (F3-F5) 1954-2020
1954-1986 Avg 56/year
1987-2020 Avg 34/year
160
140
120
100
80
60
40
20
0
1950
1960
1970
1980
1990
2000
2010
2020
F3-F5


Monthly Fraction of US with Very Wet (flood-like) or Very Dry (drought) Conditions
Jan 1895 – Dec 2020 NOAA/NCDC (20 driest months before 1988)
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
1895
1905
1915
1925
1935
1945
1955
1965
1975
1985
1995
2005
2015
Dry
Wet

Number of Daily Record High Temperatures by year for 737 USHCN Stations with at least 105 years of record (1895-2020) per 100,000 observations (expected value is 794 each year)



John R. Christy, The University of Alabama in Huntsville

NCEI/NOAA data downloaded 3 Dec 2020

Global Drought Indices 1950-2019

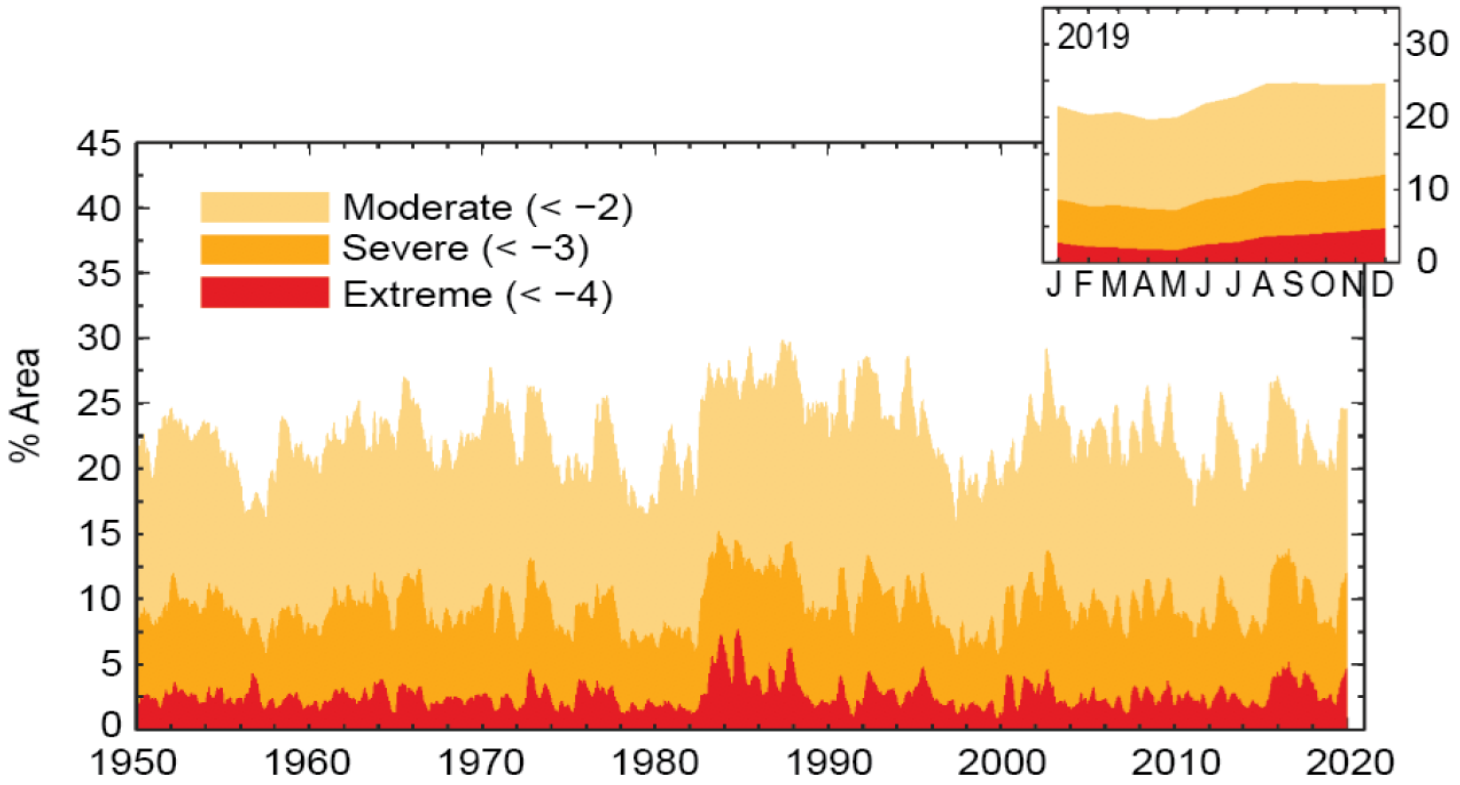


Fig. 2.34. Percentage of global land area (excluding ice sheets and deserts) with scPDSI indicating moderate (< –2), severe (< –3) and extreme (< –4) drought for each month of 1950–2019. Inset: Each month of 2019.

Western Wildfires in United States of 2020, especially California

Search The Guardian US edition

California's wildfire hell: how 2020 became the state's worst ever fire season

NEWS

California exceeds 4 million acres burned by wildfires in 2020

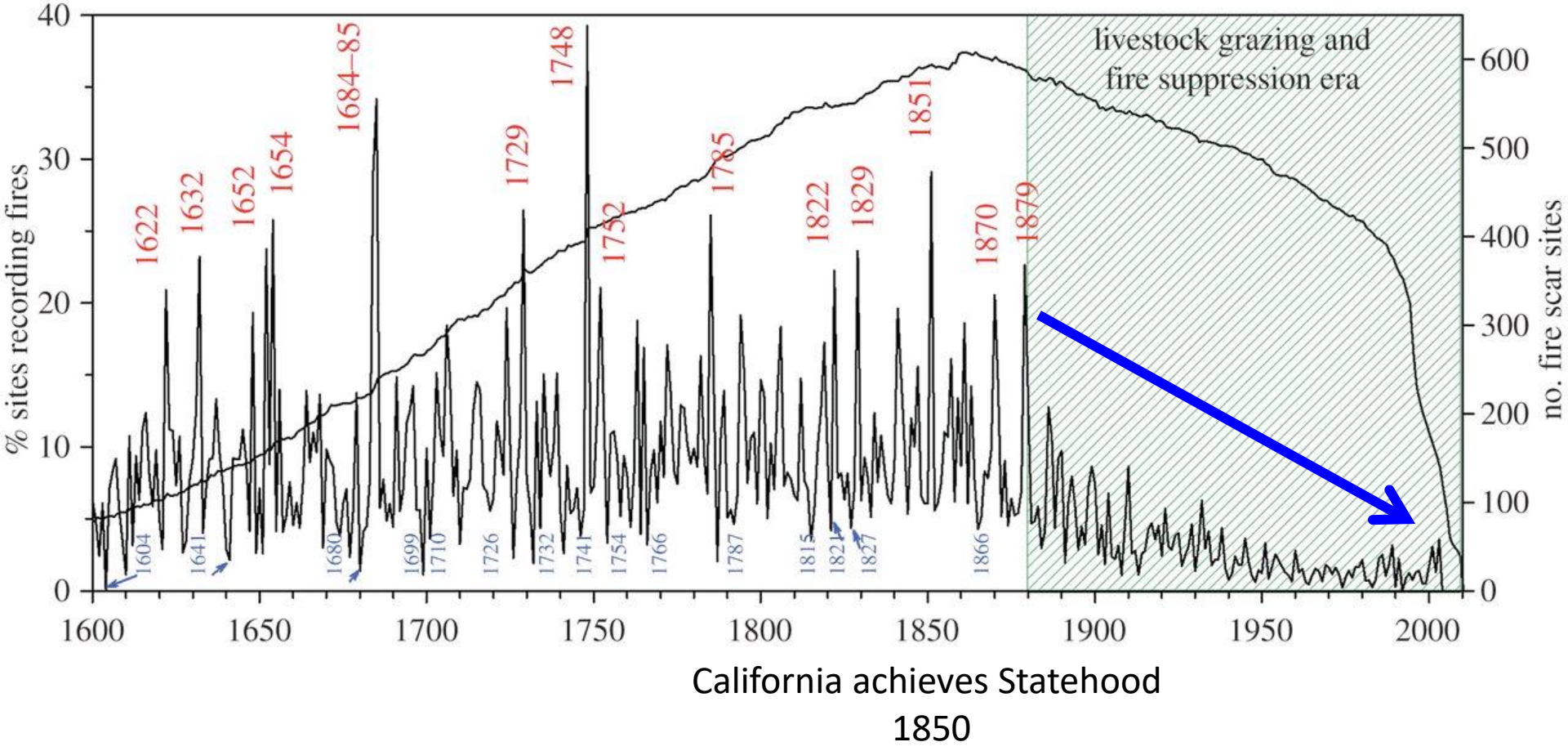
More than 8,200 fires have consumed more than double the previous record, fire officials said.

CBS EVENING NEWS

Record Torched: 2020 California Wildfires Have Burned More Than 4 Million Acres

Los Angeles Times

California fire season shatters record with more than 4 million acres burned



California achieves Statehood
1850

Incidence in wildfires in North America 1600-2000 (It's all about human management)

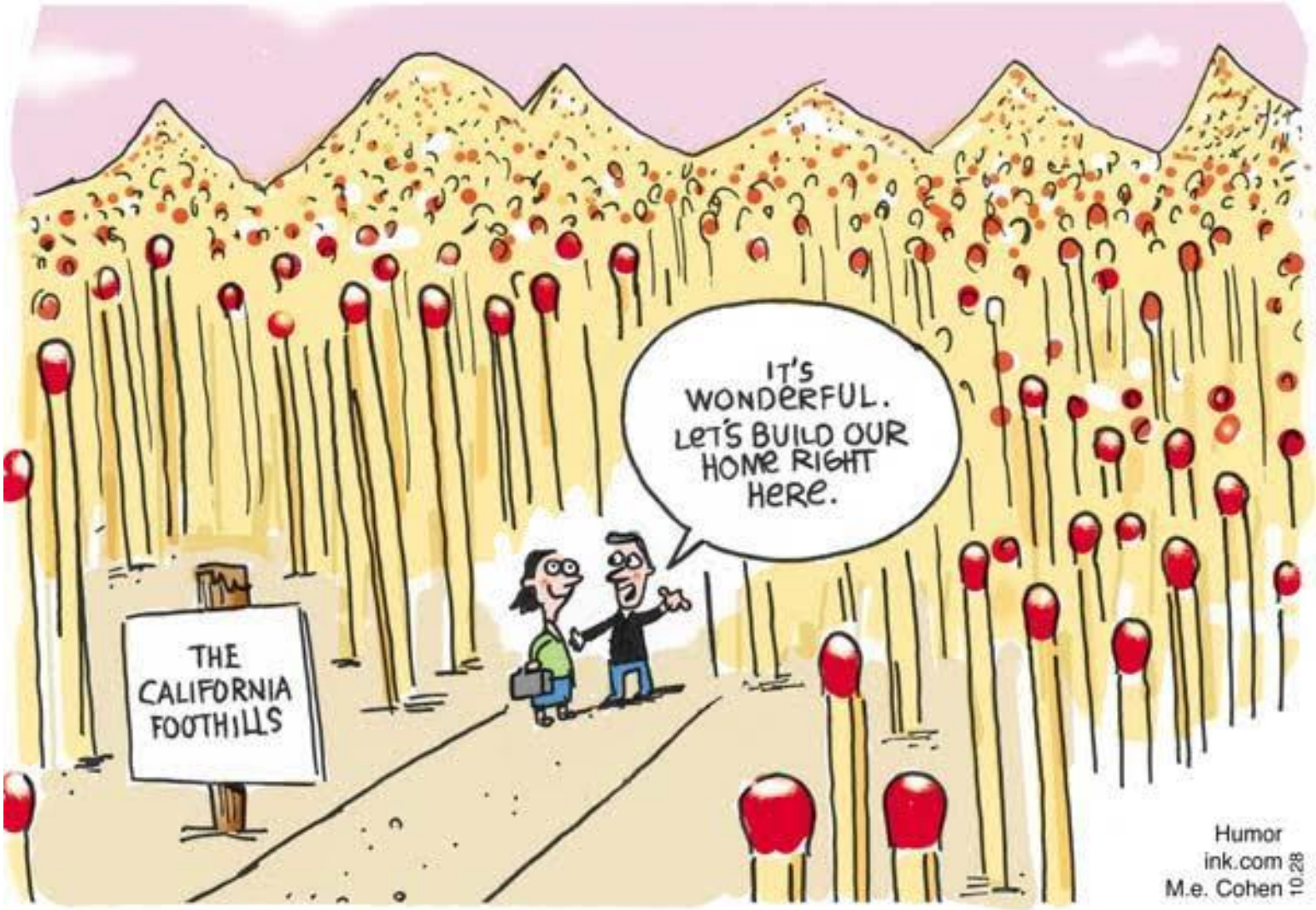
Swetnam et al. 2016 Phil Trans B

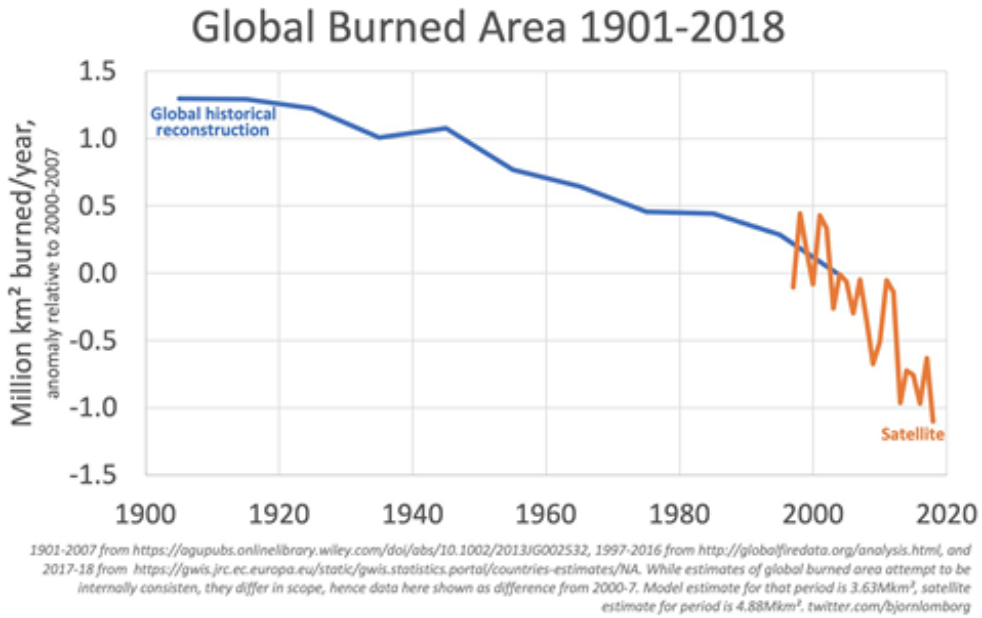
Marking my property line in Fresno Co. This is 4 miles from southern border of Creek Fire.

California was subjected to annual burns by Native Americans or Mother Nature prior to Spanish settlement. ***Pre-European burn area was 4.5 to 12 million acres in CA per year (Stephens et al. 2007.)***

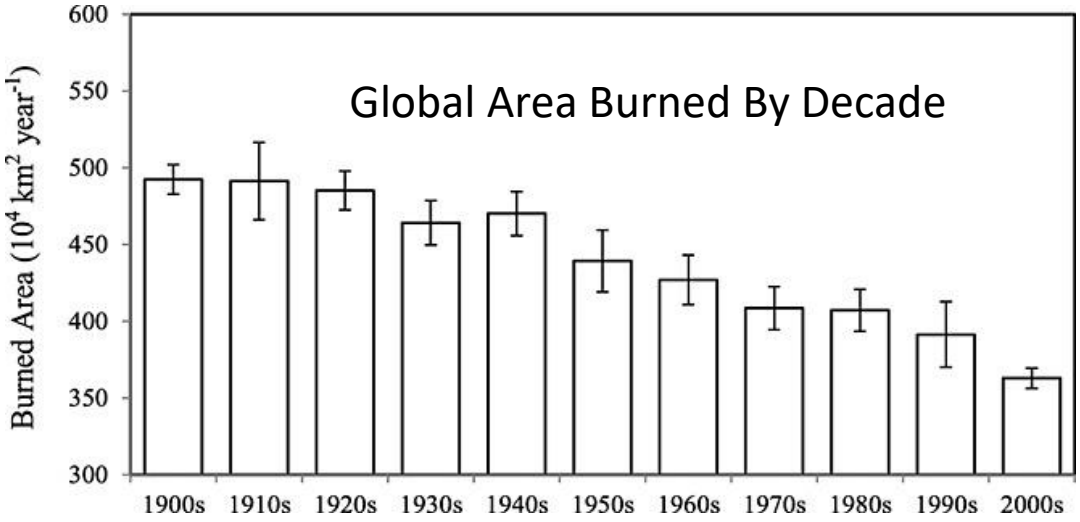
Subsequent settlers practiced "fire suppression" from the late 19th, through the 20th and 21st centuries as public policy. Significant human occupation of and access to formerly natural landscapes. Dry, unburned fuel load rose dramatically.

2020 CA acreage burned was under 4.5 million acres. Set up by (1) 2012-2015 drought, (2) weakening forests, (3) bark-beetles killed ~150 million trees left to stand (80% in areas). No harvesting allowed of dead trees creating a massive fuel debt to be burned … 2020 took care of some of that debt.


IT'S WONDERFUL. LET'S BUILD OUR HOME RIGHT HERE.
THE CALIFORNIA FOOTHILLS
Humor ink.com
M.e. Cohen 10.28

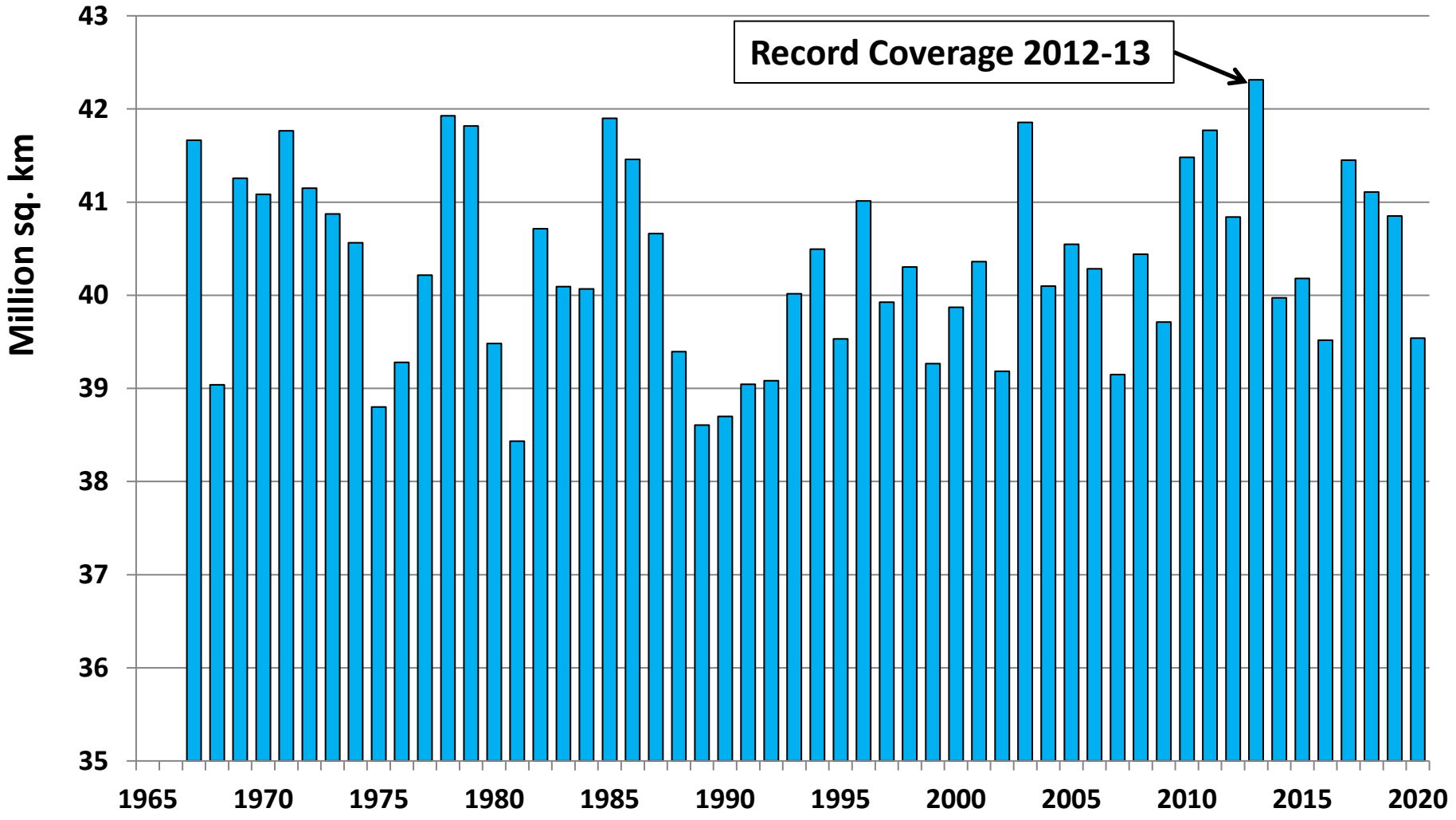


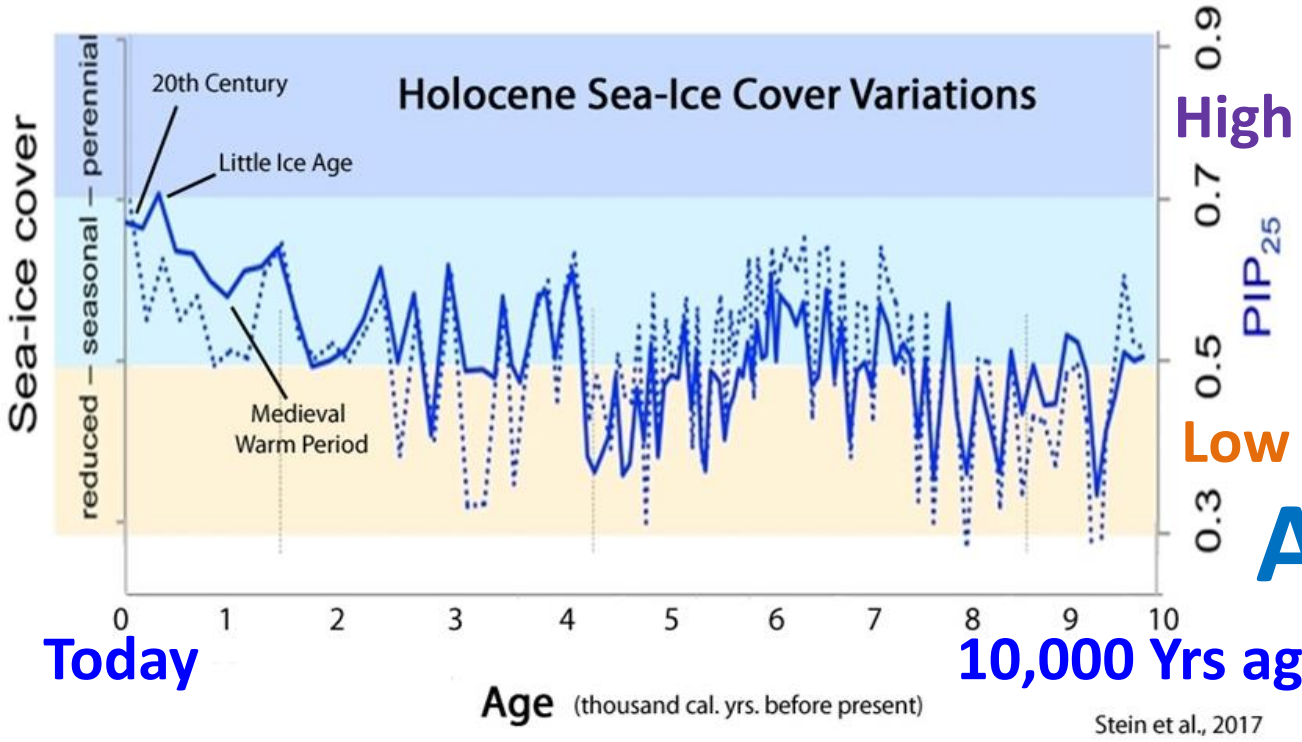
Bjorn Lomborg



Journal of Geophysical Research: Biogeosciences, Volume: 119, Issue: 3, Pages: 249-263, First published: 14 February 2014, DOI: (10.1002/2013JG002532)

NH SNOW EXTENT Million KM^2
Average November to April 1967-68 to 2019-20

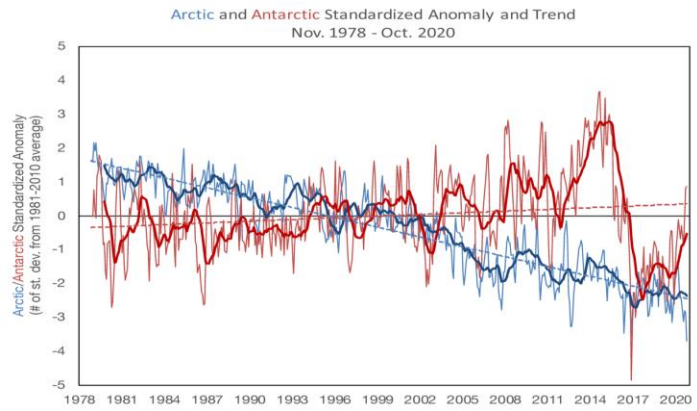


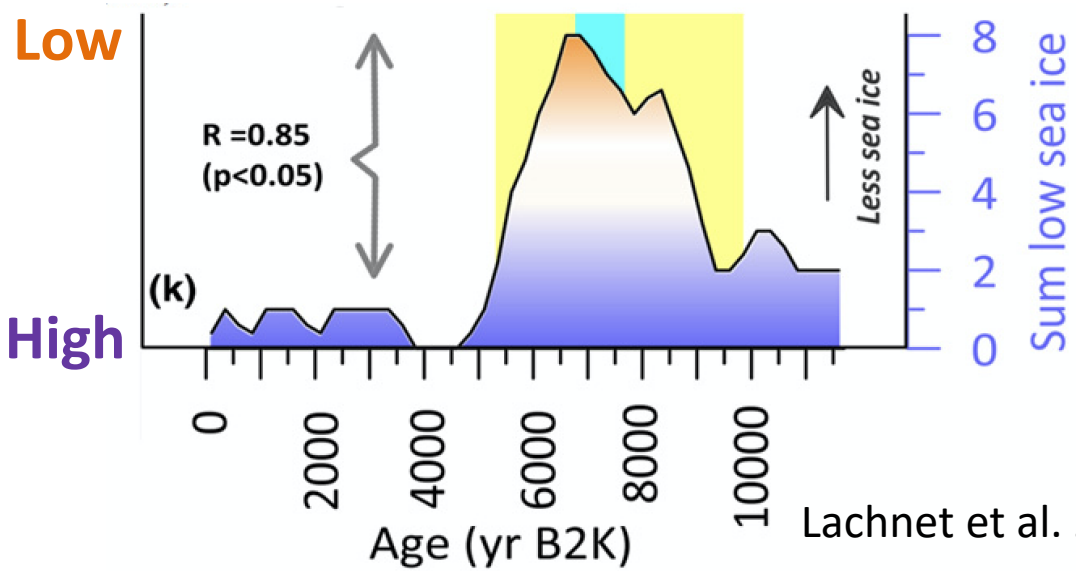


Mother Nature allows lots of variability

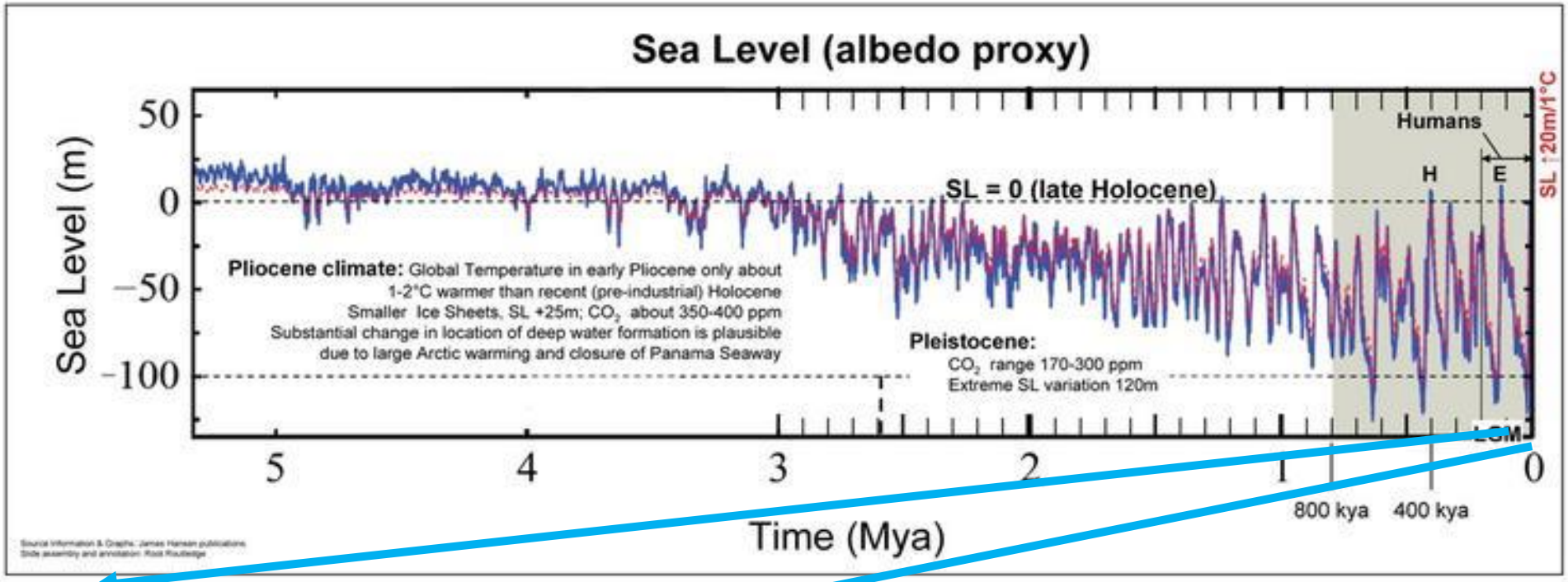
Arctic Sea Ice

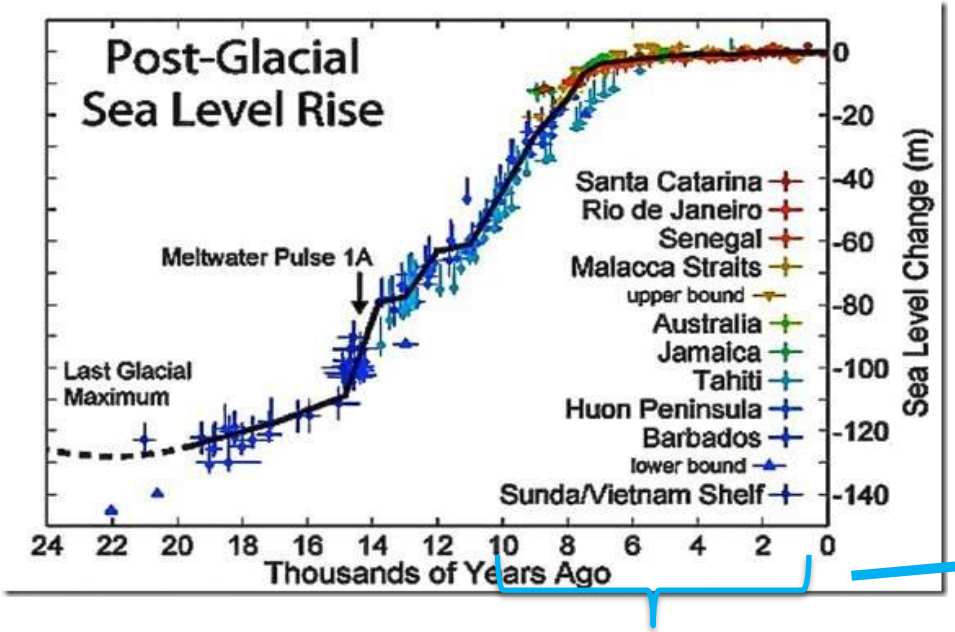
Stein et al. 2017

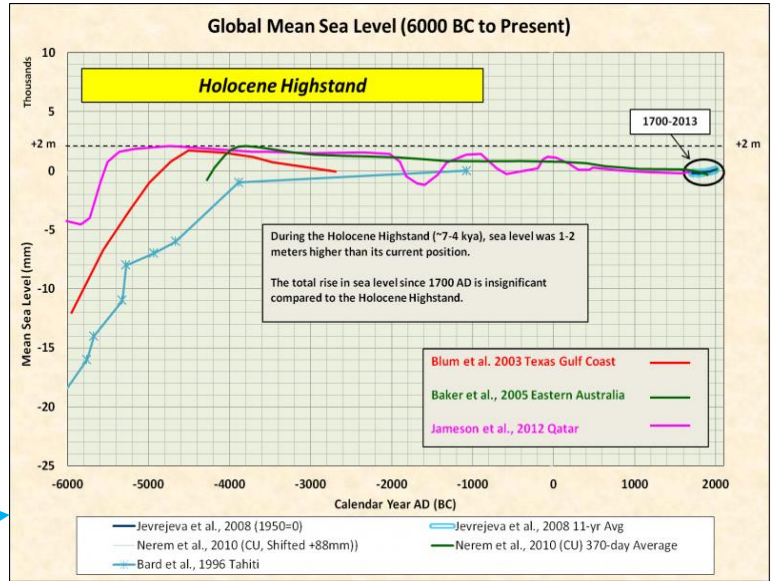


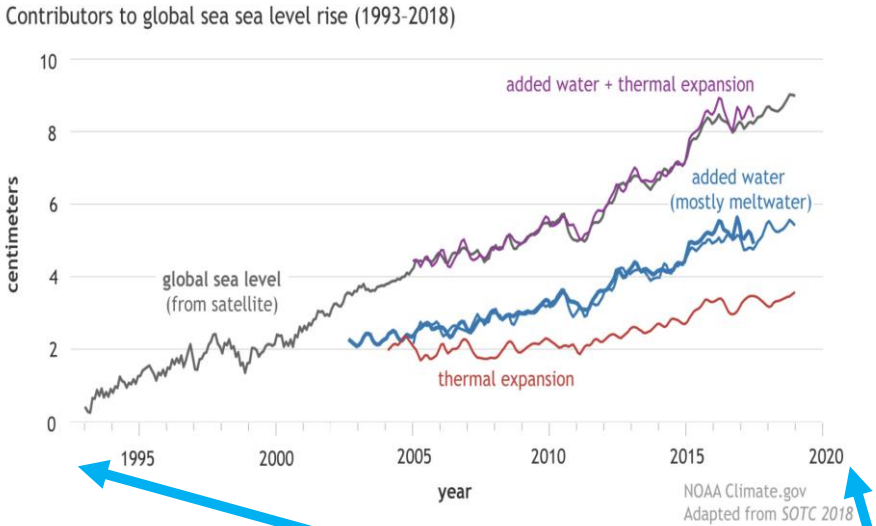


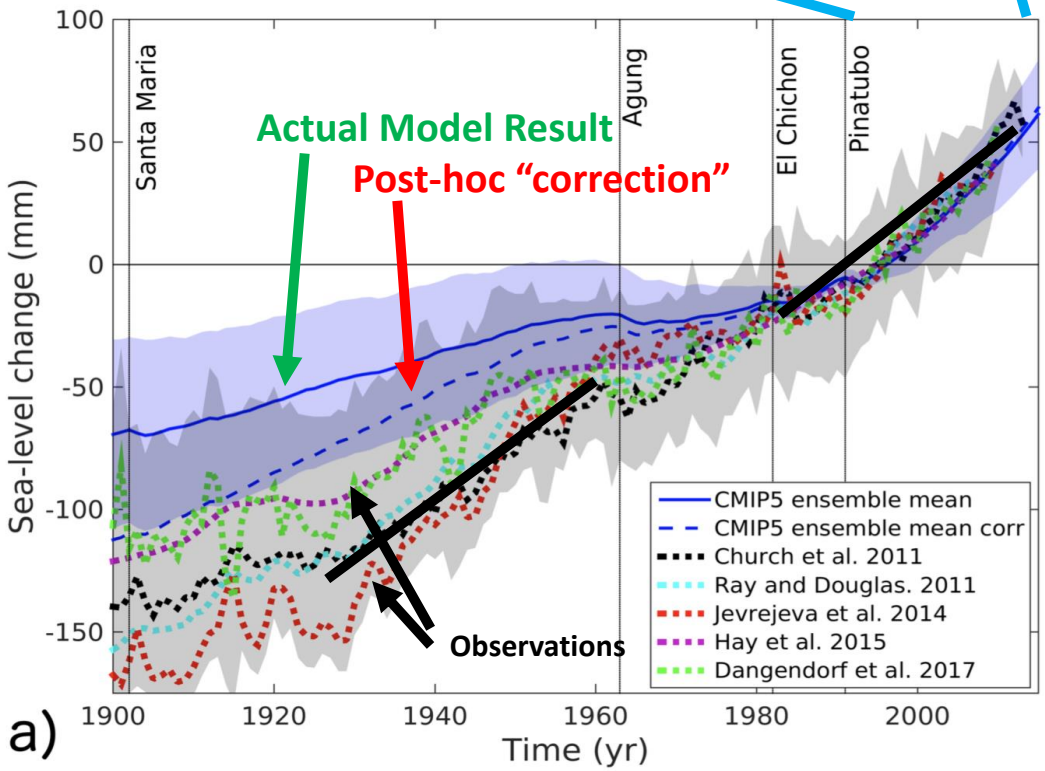
Lachnet et al. 202


Sea Level (albedo proxy)
Sea Level (m)
50
0
−50
−100
SL = 0 (late Holocene)
Humans
H
E
SL ↑20m/1°C
Pliocene climate: Global Temperature in early Pliocene only about 1-2°C warmer than recent (pre-industrial) Holocene
Smaller Ice Sheets, SL +25m; CO2 about 350-400 ppm
Substantial change in location of deep water formation is plausible due to large Arctic warming and closure of Panama Seaway
Pleistocene:
CO2 range 170-300 ppm
Extreme SL variation 120m
LGM
5
4
3
2
1
0
800 kya
400 kya
Time (Mya)


Post-Glacial Sea Level Rise
Meltwater Pulse 1A
Last Glacial Maximum
Santa Catarina
Rio de Janeiro
Senegal
Malacca Straits
upper bound
Australia
Jamaica
Tahiti
Huon Peninsula
Barbados
lower bound
Sunda/Vietnam Shelf
0
-20
-40
-60
-80
-100
-120
-140
Sea Level Change (m)
24 22 20 18 16 14 12 10 8 6 4 2 0
Thousands of Years Ago


Global Mean Sea Level (6000 BC to Present)
Holocene Highstand
1700-2013
+2 m
+2 m
During the Holocene Highstand (~7-4 kya), sea level was 1-2 meters higher than its current position.
The total rise in sea level since 1700 AD is insignificant compared to the Holocene Highstand.
Thousands
10
5
0
-5
-10
-15
-20
-25
Mean Sea Level (mm)
-6000 -5000 -4000 -3000 -2000 -1000 0 1000 2000
Calendar Year AD (BC)
Blum et al. 2003 Texas Gulf Coast
Baker et al., 2005 Eastern Australia
Jameson et al., 2012 Qatar
Jevrejeva et al., 2008 (1950=0)
Jevrejeva et al., 2008 11-yr Avg
Nerem et al., 2010 (CU, Shifted +88mm))
Nerem et al., 2010 (CU) 370-day Average
Bard et al., 1996 Tahiti





Sea Level (Previous Slide)
2-3m higher 7,000 yrs ago
6-9m higher 130,000 yrs ago
10-25m higher 3M yrs ago

Glaciers largest extent in past 10,000 years ~1850, likely lowest sea level in that period

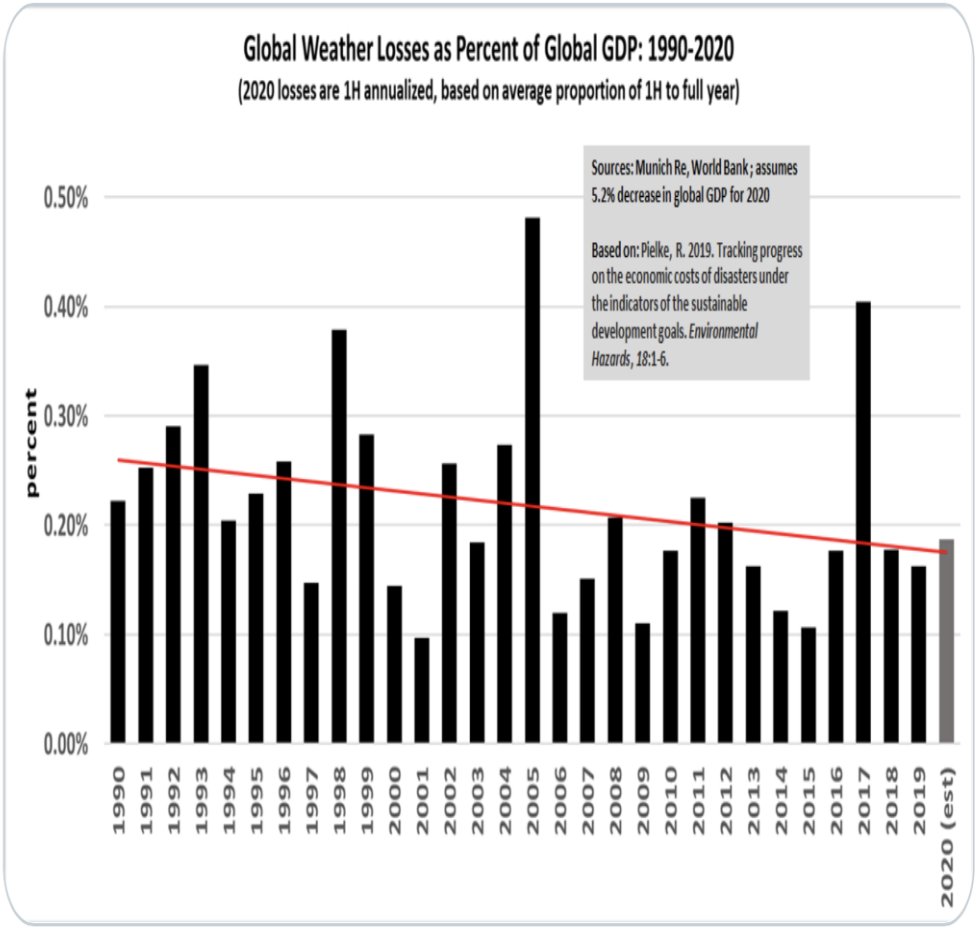
Sea Levels started rising in 1860 and continued to present

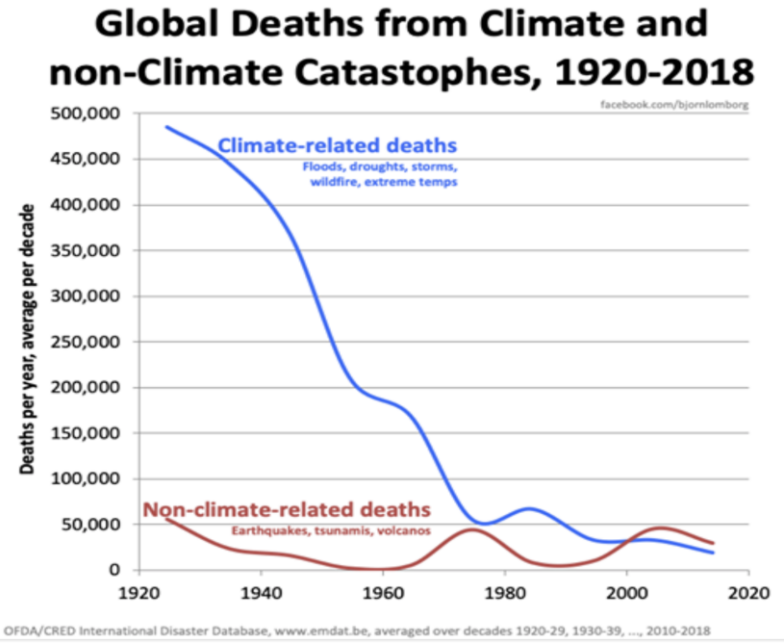
Rate 1925-1960 similar to 1980-2018.

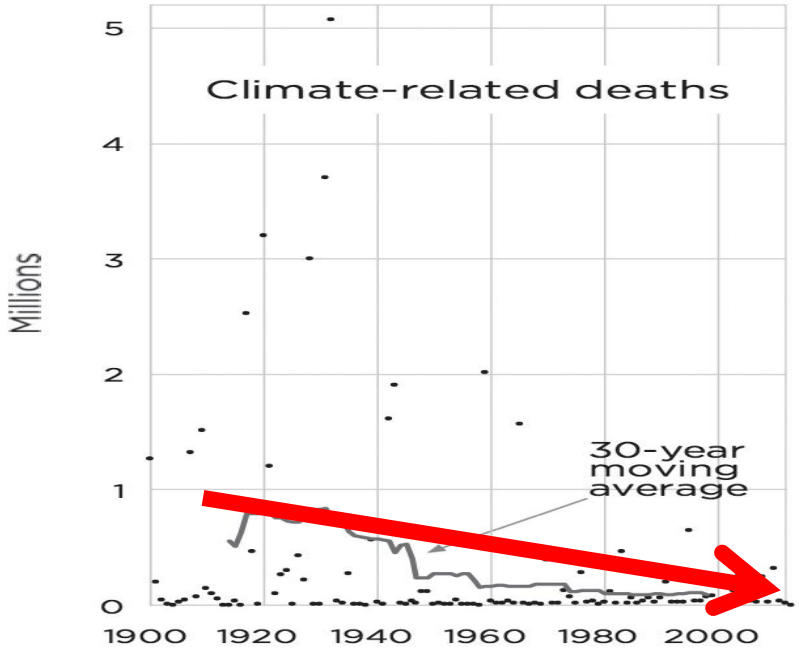
70% of current rise due to added water with thermal expansion 25%

CMIP5 models unable, even after post-hoc "corrections," to reproduce the early SLR.

The last century's warming has been good for Humanity







Progress toward eradicating poverty based on accessible and affordable energy (which is carbon today) will continue

“The Chinese lifted 400 million people out of poverty by building a coal-fired power plant every week.”

Viewed as bad by the very wealthy environmental activist who said it

Viewed as good by the 400 million human beings no longer living in poverty (and many more millions who strive to end poverty)

“The Chinese lifted 400 million people out of poverty by building a coal-fired power plant every week.”

Viewed as bad by the very wealthy environmental activist who said it

Viewed as good by the 400 million human beings no longer living in poverty (and many more millions who strive to end poverty)

“The Chinese lifted 400 million people out of poverty by building a coal-fired power plant every week.”

Viewed as bad by the very wealthy environmental activist who said it

Viewed as good by the 400 million human beings no longer living in poverty (and many more millions who strive to end poverty)

In 2020, China’s coal use rose to highest since 2015 (Reuters)

… and with record cold temperatures in parts of China in early 2021, many windmills were idled – too much ice on blades.

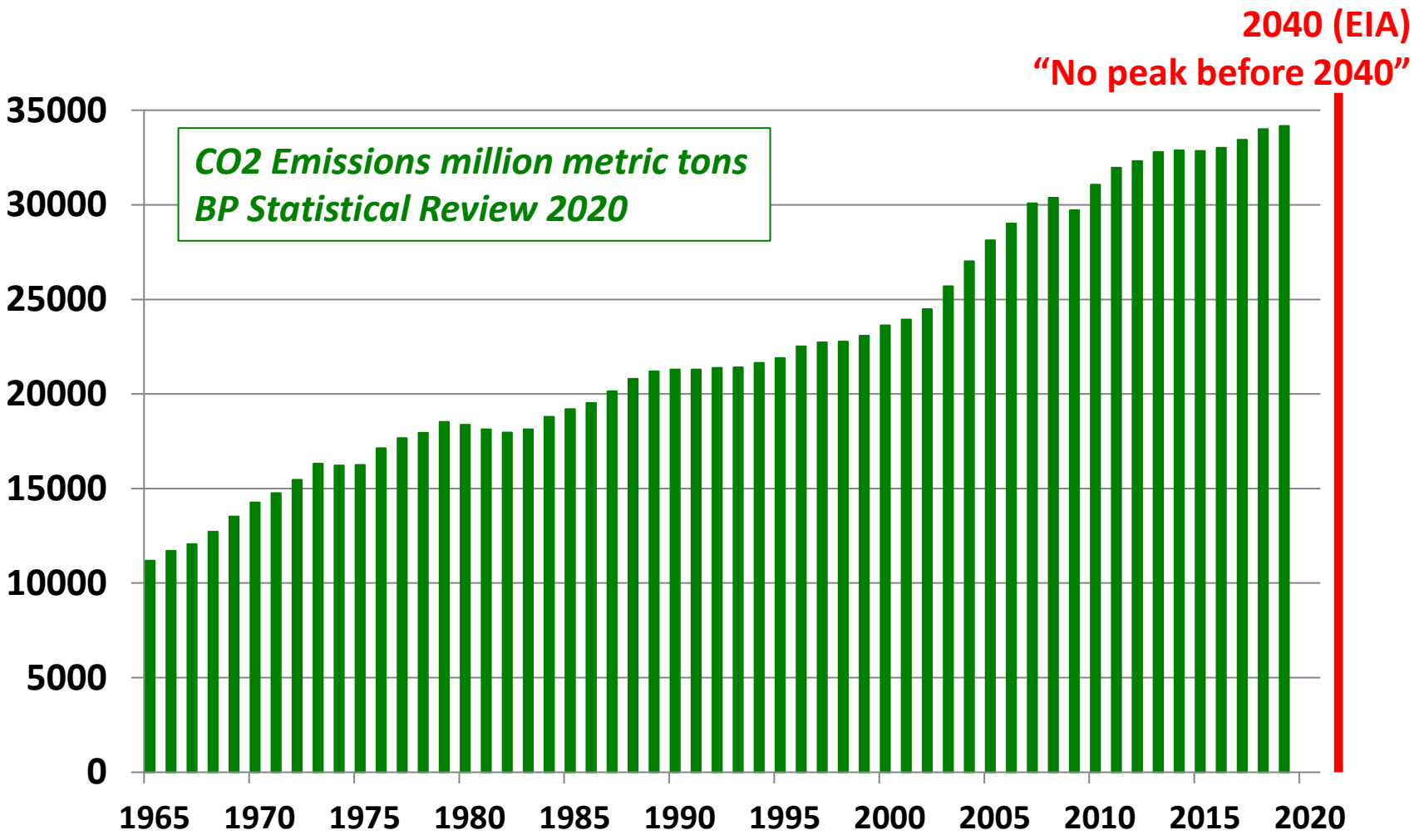
“The Chinese lifted 400 million people out of poverty by building a coal-fired power plant every week.”

Viewed as **bad** by the very wealthy environmental activist who said this

Viewed as **good** by the 400 million human beings no longer living in poverty (and many more millions who strive to end poverty)

An undeniable force:
No one wants to be poor.

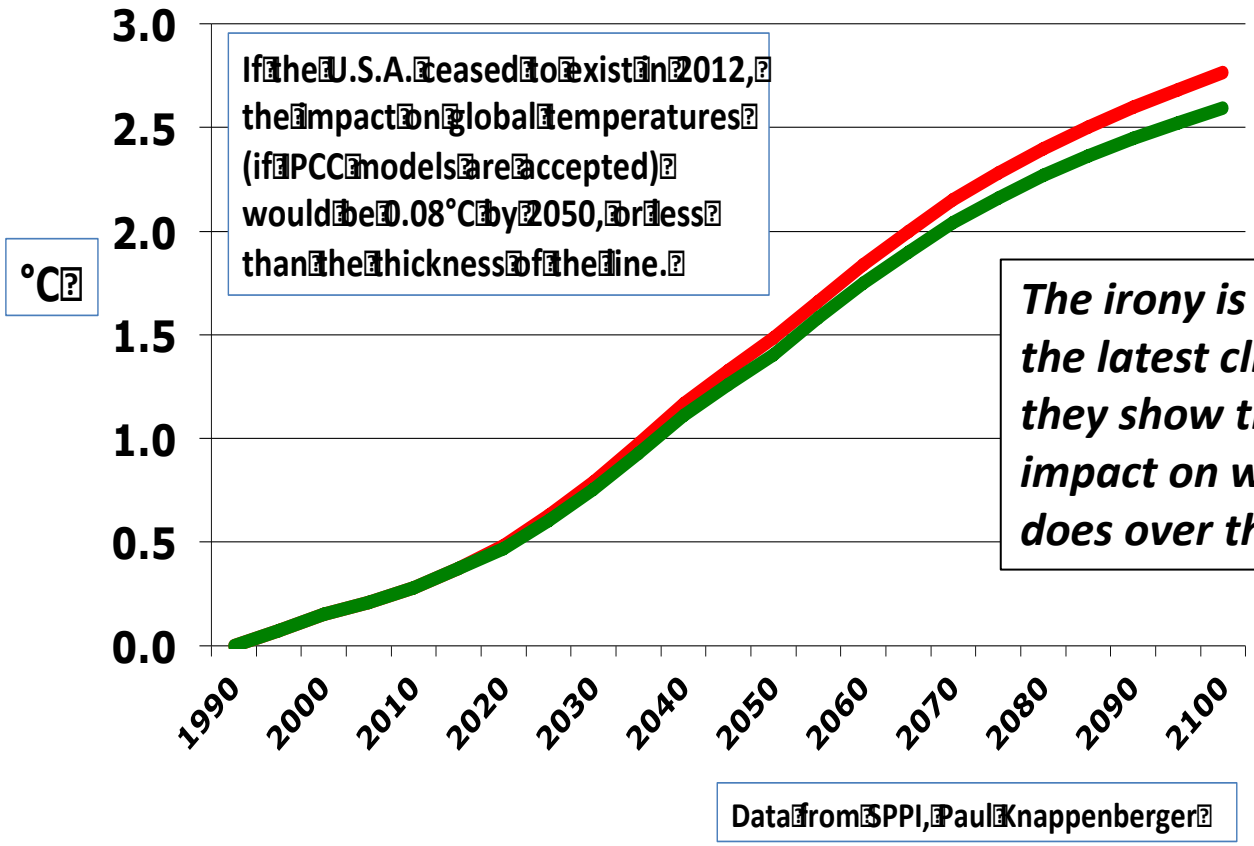
The evidence from actual data: The drive to live a longer and better life is preferable to succumbing to the constraints of environmental virtue.



Without Energy Life is Brutal and Short

Will CO2 regulations "save" the planet?

Red – Temperature IPCC A1B Emissions
Green – U.S. stops all emissions 2012



No

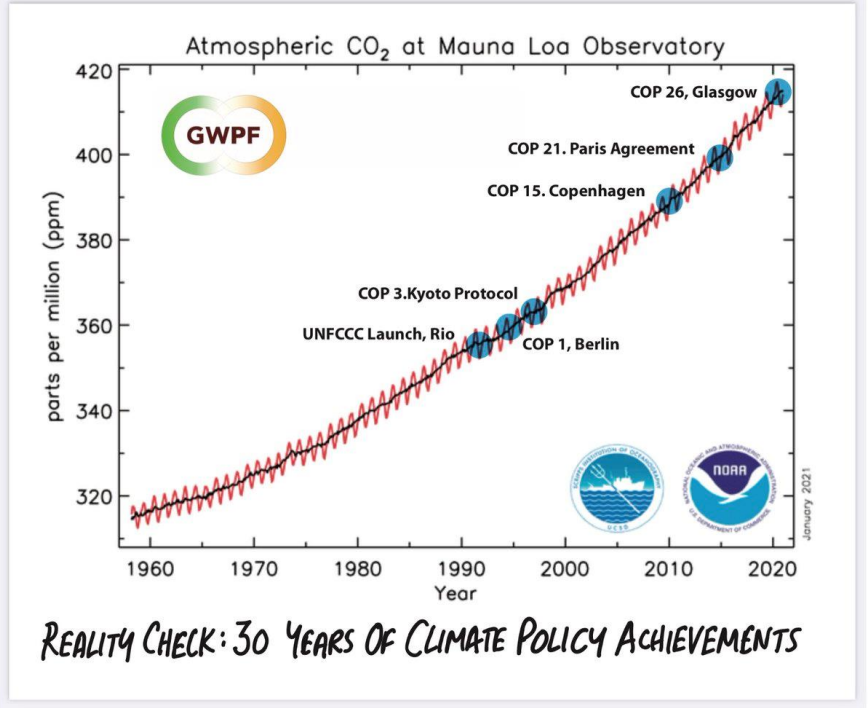
The irony is that even if you accept the latest climate model simulations, they show that the US will have little impact on whatever the temperature does over the next century

Three points the evidence supports:

1. The Established Global Warming Theory *significantly* misrepresents the impact of extra Greenhouse Gases.

2. The weather that affects people the most is not becoming more extreme or dangerous

3. Progress toward eradicating poverty based on accessible and affordable energy (which is carbon today) is continuing.



(2019) The average American is smarter than you think – they recognize it when an elitist is exaggerating a story, the end result of which is to deny this average guy some aspect of life he/she wants and needs (while the elitist maintains a luxurious lifestyle).

(2021). The average American is going to learn what a political party who wants to eliminate carbon usage is going to mean for their lives. However, if re-election is still a main driving force, perhaps this party will look for hard evidence to find excuses for not punishing the electorate with higher and higher energy prices.

Demonstrating that claims of climate campaigners are exaggerated or false ensures isolation, denigration and criticism from the climate establishment and major media … and in 2021 the elected federal government now joins in.

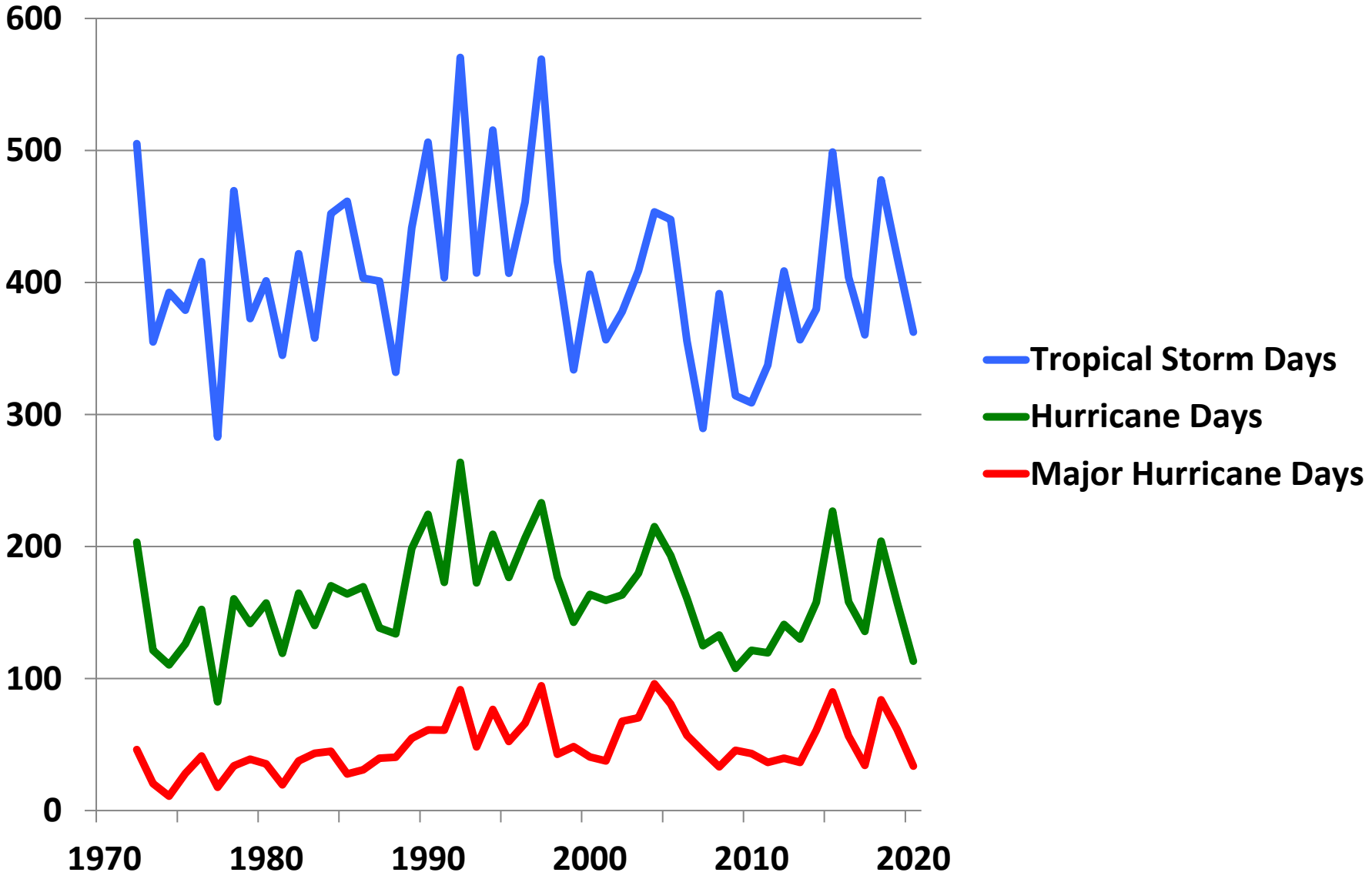
The facts don't seem to matter to them.

Is this the "Science Way"?

36 hours after "March For Science" with emphasis on climate change, 7 rounds were fired into my building/office suite.

Thank You

Global Number of storm-days per year of Tropical Storm (>63 km/hr), Hurricane (>119 km/hr) and Major Hurricane (>178 km/hr) 1979-2020



Klotzbach Col State Univ