Global greening versus global warming

Matt Ridley

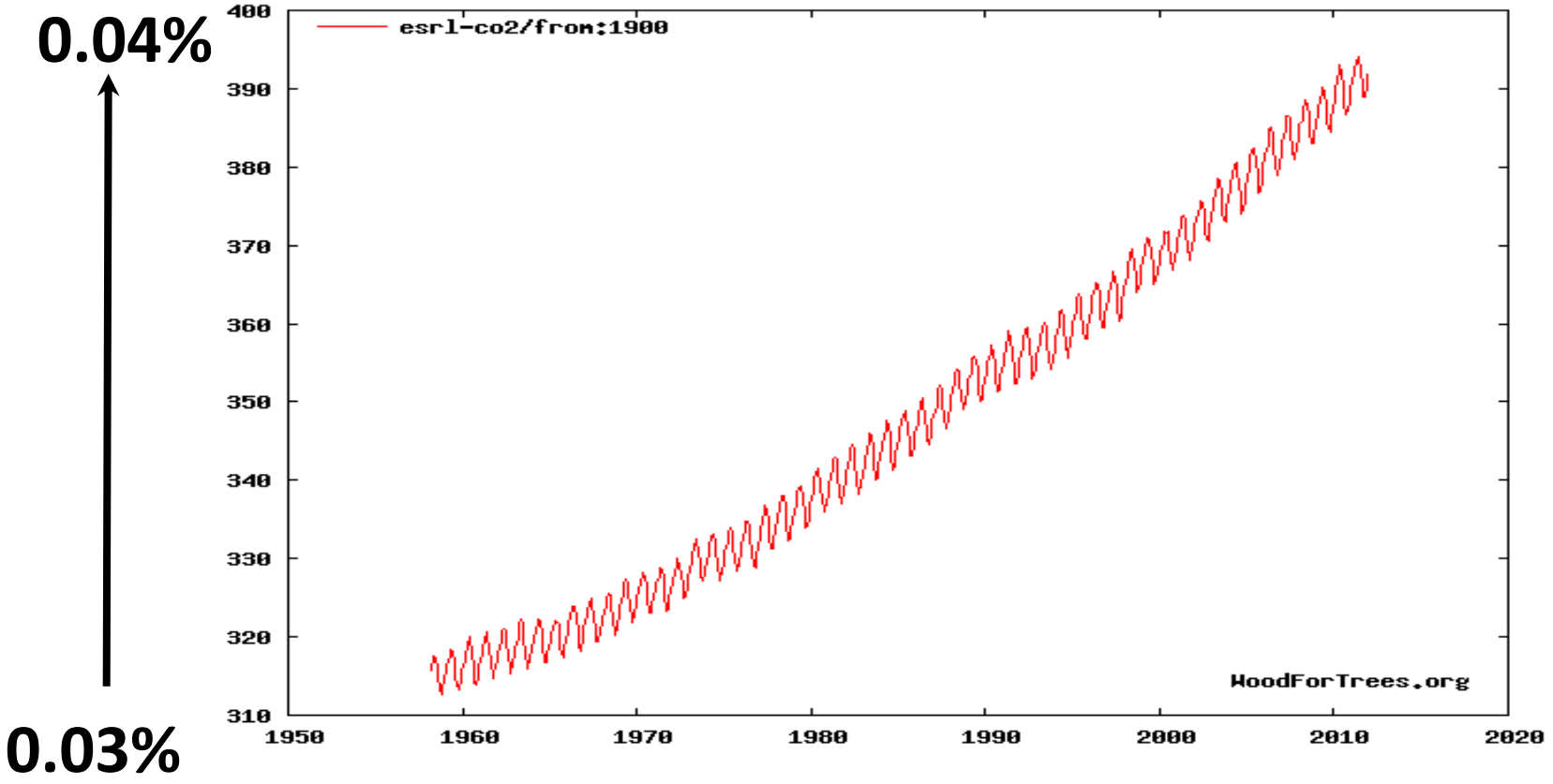
Why do I think the risk from global warming is being exaggerated?

- Environmental predictions of doom almost always are;
- the models have been consistently wrong for more than 30 years;
- climate sensitivity is now known to be relatively low;
- the climate science establishment has a vested interest in alarm.

Failed Forecasts of Doom

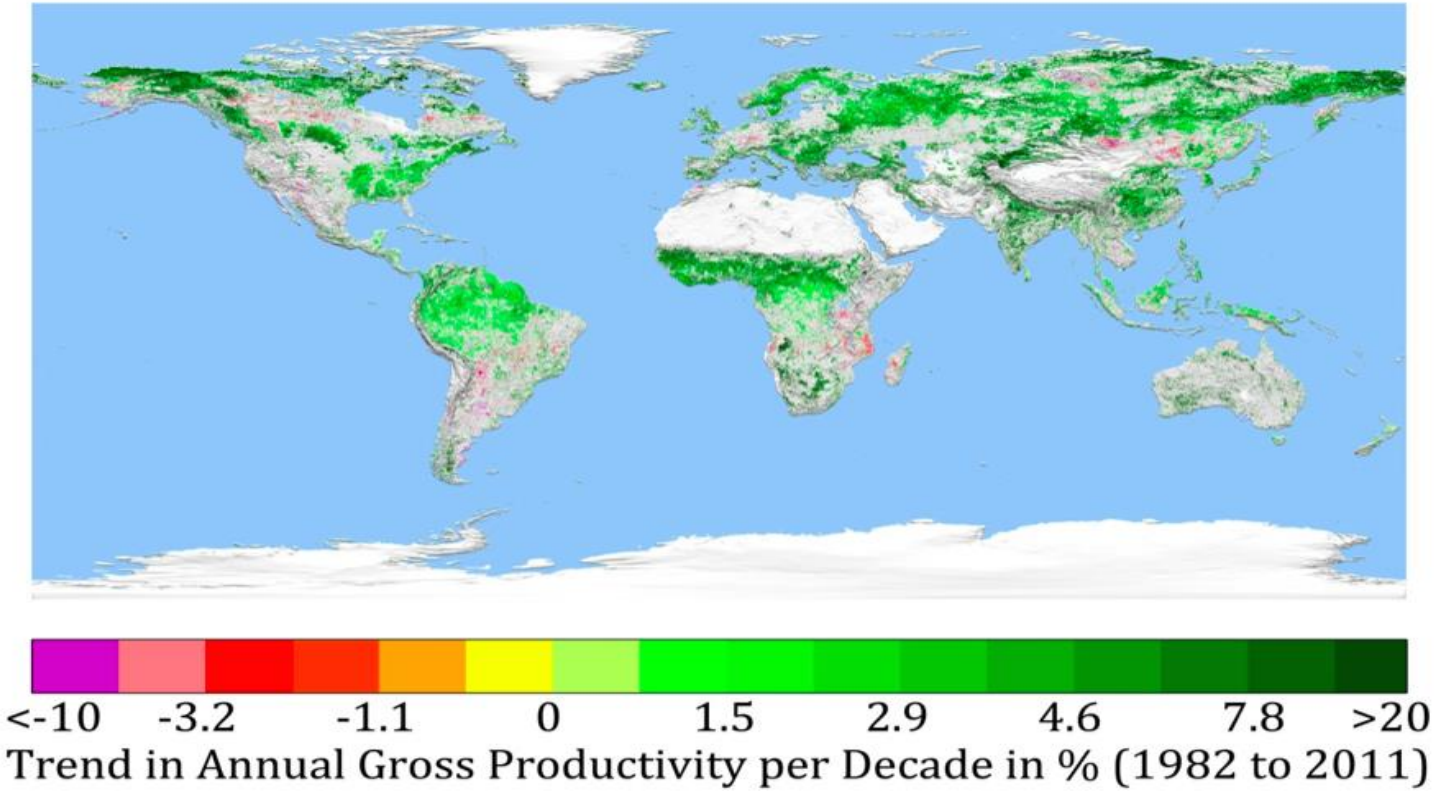
- the population explosion would be unstoppable;
- global famine would be inevitable;
- crop yields would fall;
- a cancer epidemic caused by pesticides would shorten our lives;
- the desert would advance;
- rainforests would disappear;
- acid rain would destroy forests;
- oil spills would worsen;
- oil and gas would run out;
- and so would most metals;
- the Great Lakes would die;
- dozens of bird and mammal species would become extinct each year;
- a new ice age would begin;
- Nanotechnology would run riot
- GMOs would wreck ecosystems
- Sperm counts would fall
- Y2k

Carbon dioxide levels



Global Greening

Global greening



http://probing.vegetation.be/sites/default/files/pdf/dag1/1100-Ranga%20Myneni-myneni-probing-vegetation-talk-2.pdf

14% greener over 30 years

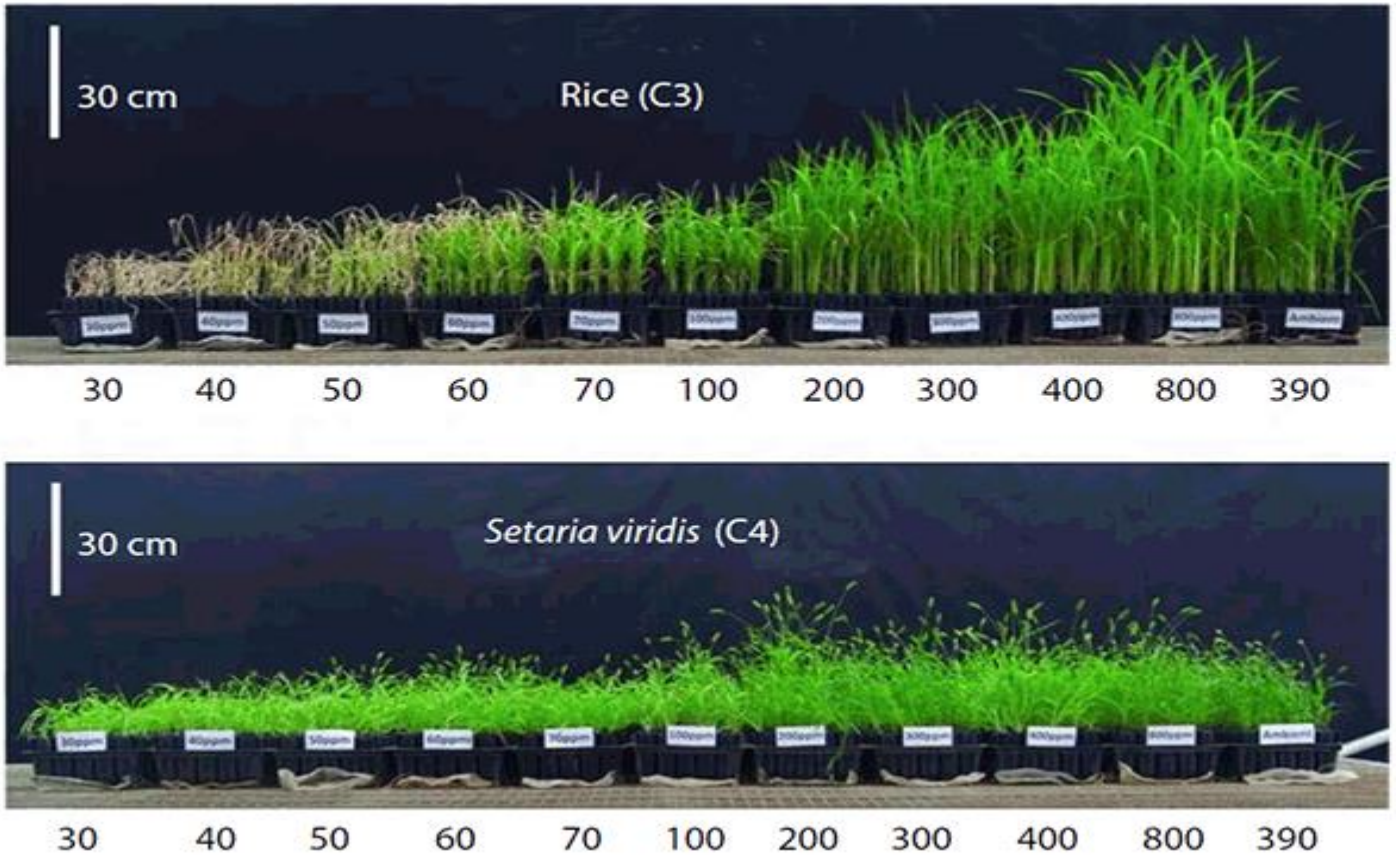
By How Much did the Earth Green over the Past 30 years?

IGBP Land Cover Classes	Area			Productivity	
	G (%)	B (%)	N (%)	I (%)	D (%)
Evergreen broadleaf forests	5.62	0.15	7.10	2.27	-0.04
Deciduous broadleaf forests	0.54	0.09	0.95	0.23	-0.05
Cropland/Natural vegetation mosaics	2.27	0.13	4.30	1.26	-0.09
Savannas	1.67	0.40	6.03	0.94	-0.16
Mixed forests	3.56	0.40	8.33	1.96	-0.19
Woody savannas	2.85	0.05	2.96	1.22	-0.03
Croplands	3.41	0.21	7.15	1.75	-0.12
Closed shrublands	1.80	0.19	3.36	0.68	-0.06
Evergreen needleleaf forests	0.92	0.01	1.15	0.25	0.00
Deciduous needleleaf forests	0.18	0.09	1.07	0.11	-0.07
Grasslands	2.86	0.48	10.53	1.08	-0.18
Open shrublands	5.18	0.57	13.39	1.80	-0.22
Total	30.87	2.76	66.32	13.54	-1.21

- **31% of the global vegetated area greened**
- **This greening translates to a 14% increase in gross productivity**
- **The greening is seen in all vegetation types**

http://probing.vegetation.be/sites/default/files/pdf/dag1/1100-Ranga%20Myneni-myneni-probing-vegetation-talk-2.pdf

The CO2 fertilisation effect



Parts per million CO2

THE WALL STREET JOURNAL.


THE MIDDLE SEAT
Why the Big Three Airlines Are So Much the Same

Your Used iPhone or iPad Isn't Dead Yet


Tall and Tan and Young...and Miffed


Wardrol
Men as
Goes Ca

MIND & MATTER

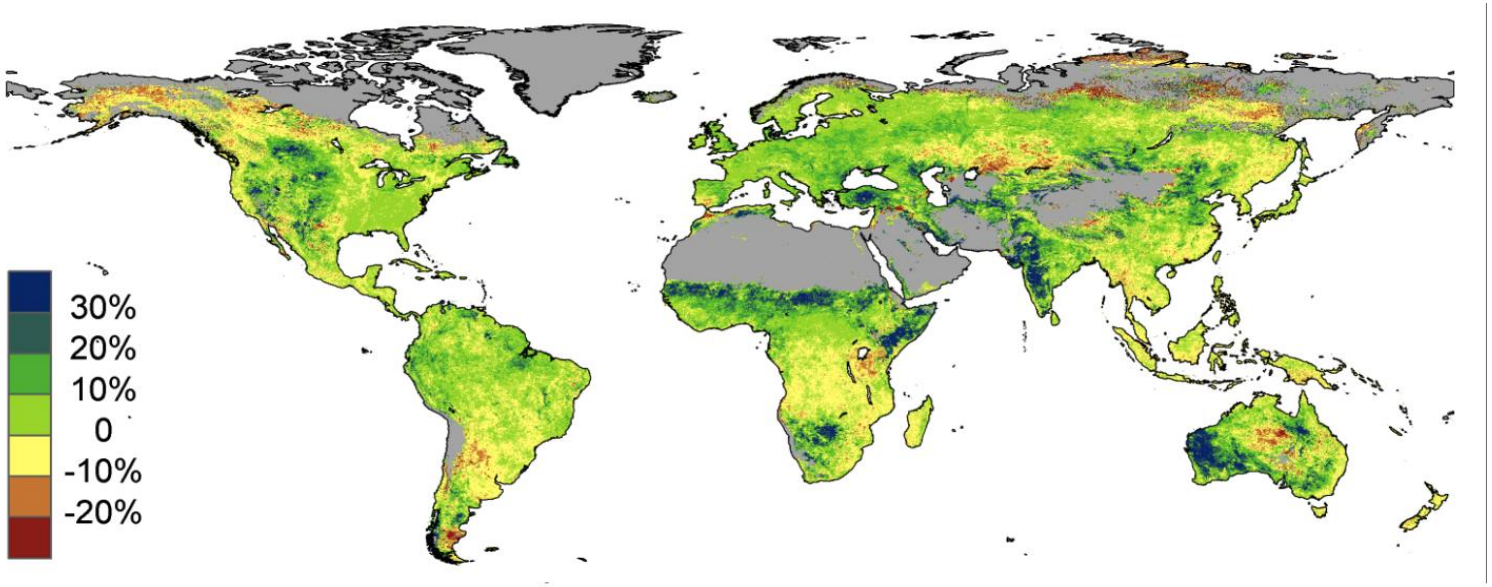
How Fossil Fuels Have Greened the Planet

By MATT RIDLEY
Jan. 4, 2013 9:40 p.m. ET

Did you know that the Earth is getting greener, quite literally? Satellites are now confirming that the amount of green vegetation on the planet has been increasing for three decades. This will be news to those accustomed to alarming tales about deforestation, overdevelopment and ecosystem destruction.

This possibility was first suspected in 1985 by Charles Keeling, the scientist whose meticulous record of the content of the air atop Mauna Loa in Hawaii first alerted the world to the increasing concentration of carbon dioxide in the atmosphere. Mr. Keeling's

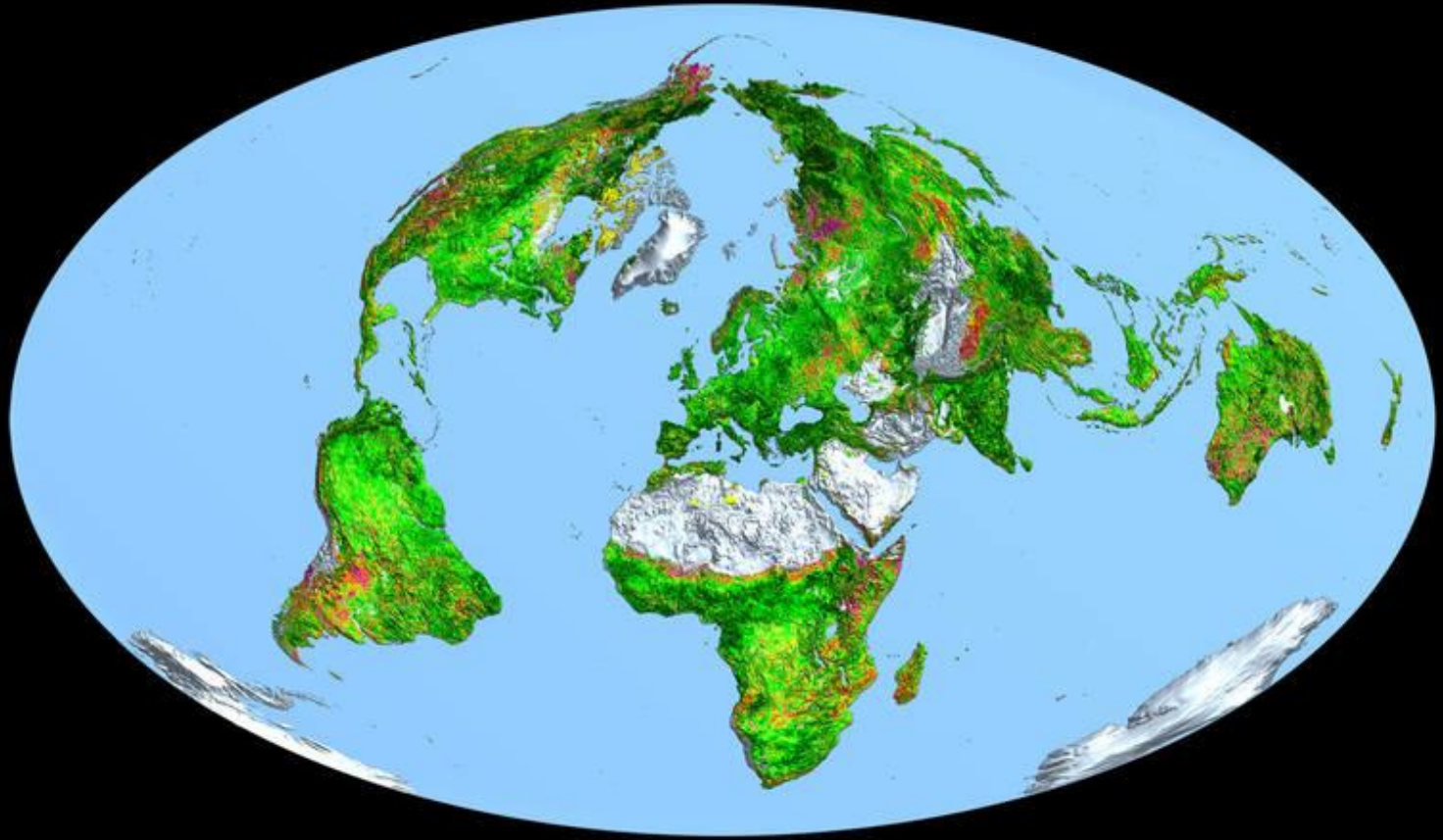
Change in greenery, 1981-2011



"Our work was able to tease-out the CO2 fertilization effect by using mathematical modeling together with satellite data adjusted to take out the observed effects of other influences such as precipitation, air temperature, the amount of light, and land-use changes."

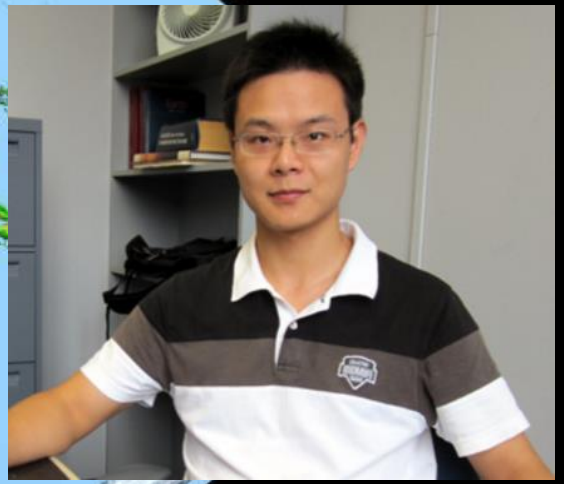
– R. Donohue, 2013

http://onlinelibrary.wiley.com/doi/10.1002/grl.50563/abstract


Change In Leaf Area (1982-2015)
<-30
<-15
-5
5
15
25
35
>50
Percent

"The greening over the past 33 years reported in this study is equivalent to adding a green continent about two times the size of mainland USA (18 million km^2)."

Zaichun Zhu, Beijing University, 2016



Change In Leaf Area (1982-2015)

<-30 <-15 -5 5 15 25 35 >50

Percent

PUBLIC RELEASE: 25-APR-2016

CO2 fertilization greening the earth

International team reports CO2 fertilization prompted plants and trees to sprout extra green leaves equivalent in area to two times the continental USA, or nearly 4.4 billion General Shermans (largest giant Sequoia tree)

BOSTON UNIVERSITY

The beneficial aspect of CO2 fertilization in promoting plant growth has been used by contrarians, notably Lord Ridley (hereditary peer in the UK House of Lords) and Mr. Rupert Murdoch (owner of several news outlets), to argue against cuts in carbon emissions to

Crop Water Productivity

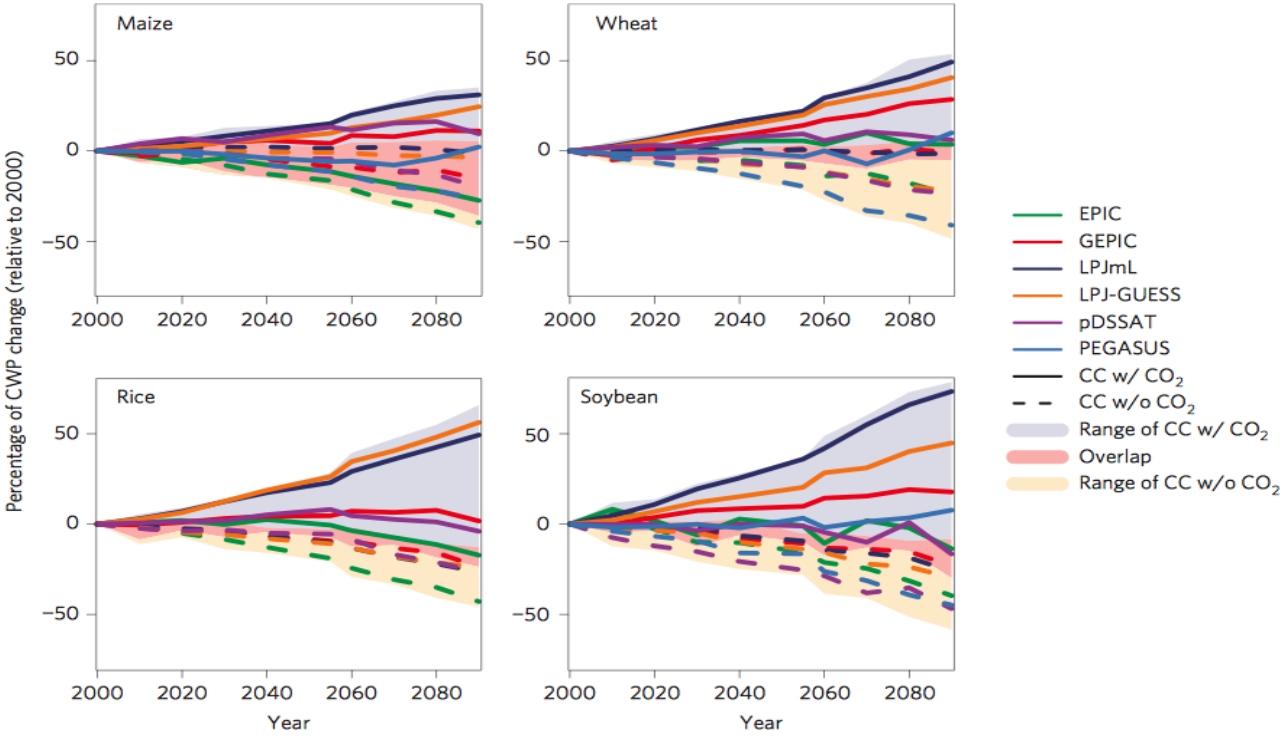


Figure 4 | Global average CWP (%) relative to 2000 simulated under RCP 8.5 for each GGCM driven by five different GCMs. Solid lines show median CWP under both climate change and CO_2 effects, whereas dashed lines show median CWP under climate change effects only—that is, with constant [CO_2]. Shaded areas show the range across the GGCM–GCM ensemble under CC w/o CO_2 (yellow) and CC w/ CO_2 (blue), distinctively, and overlap between CC w/o CO_2 and CC w/ CO_2 (red).

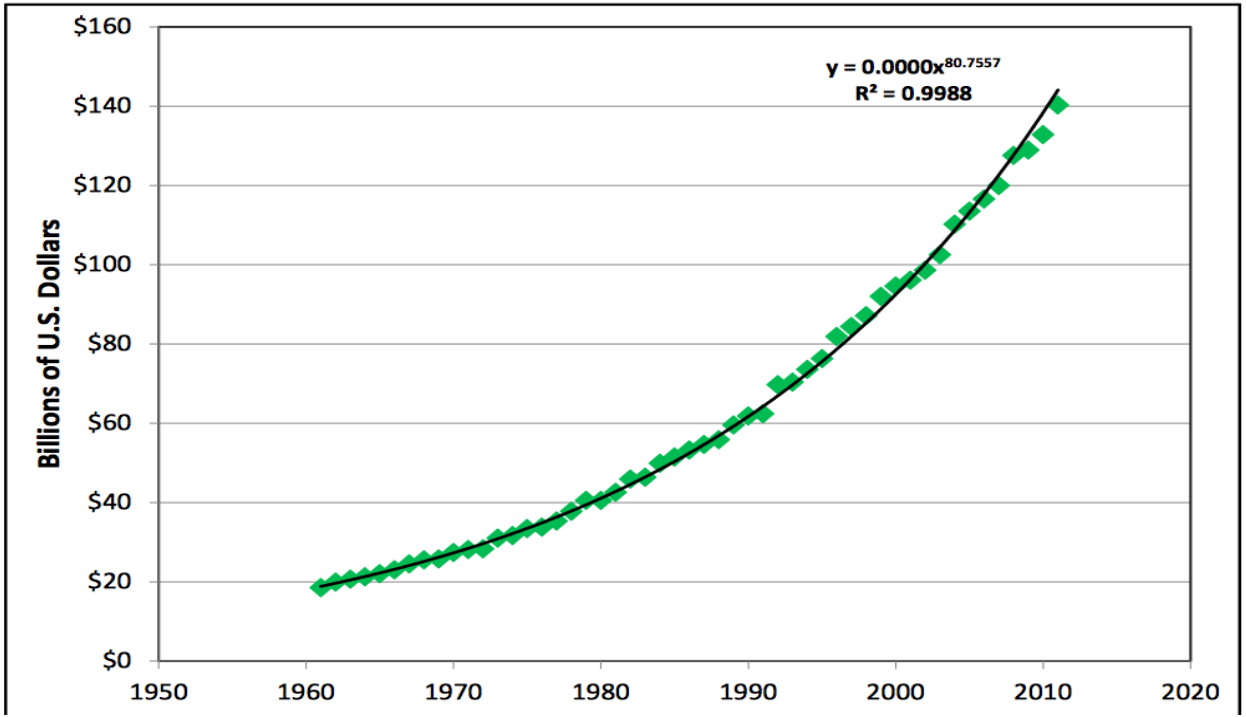
Global greening

Table 3. LAI trends for each vegetation type and over each continent (units are 10^{-2} m^2 m^{-2} yr^{-1}). The percentage of area of each continent covered by each vegetation type is given in bracket in %. Bold values highlight high trend values (greater than 3.5 m^2 m^{-2} $yr-1$) over significant areas (greater than 10%).

Product	Vegetation Type	Africa	Asia	Europe	North America	South America	Oceania	Global
GEOV1	All	2.28	2.71	**3.48**	2.73	2.80	2.25	2.75
LAI-MC	Broadleaf forests	1.32 (5)	2.05 (3)	**4.65 (17)**	3.11 (7)	3.87 (8)	0.92 (7)	3.51 (6)
LAI-MC	Coniferous forests	- (0)	**4.11 (14)**	**4.74 (20)**	**3.94 (24)**	4.37 (1)	- (0)	**4.19 (11)**
LAI-MC	Evergreen forests	3.03 (14)	3.22 (7)	- (0)	3.66 (4)	3.07 (43)	**4.82 (12)**	3.16 (13)
LAI-MC	Summer crops	2.63 (3)	**4.28 (13)**	**3.95 (18)**	3.01 (7)	0.29 (1)	2.80 (6)	3.95 (8)
LAI-MC	Winter crops	1.86 (1)	1.85 (3)	1.88 (2)	2.59 (5)	3.38 (5)	- (0)	2.62 (3)
LAI-MC	Grasslands	2.93 (30)	2.84 (30)	**3.89 (21)**	2.39 (34)	2.69 (32)	2.05 (40)	2.78 (31)

https://www.mdpi.com/2072-4292/10/3/424/htm

Total annual monetary value of the direct CO2 benefit on crop production for 45 crops



http://www.co2science.org/education/reports/co2benefits/MonetaryBenefitsofRisingCO2onGlobalFoodProduction.pdf

WORLDS IN THE MAKING

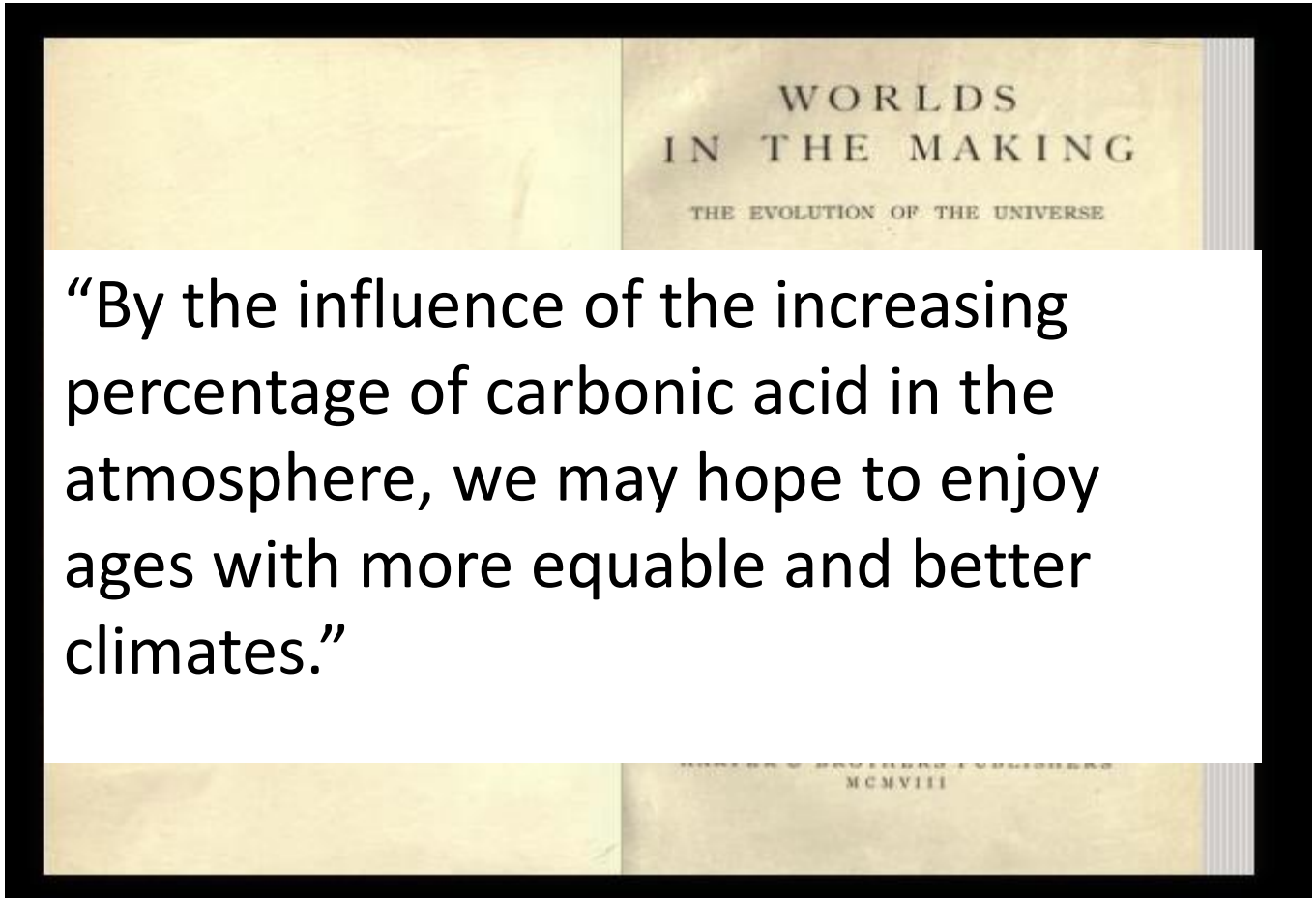
THE EVOLUTION OF THE UNIVERSE

BY
SVANTE ARRHENIUS
DIRECTOR OF THE PHYSICO-CHEMICAL NOBEL INSTITUTE, STOCKHOLM

TRANSLATED BY
DR. H. BORNS

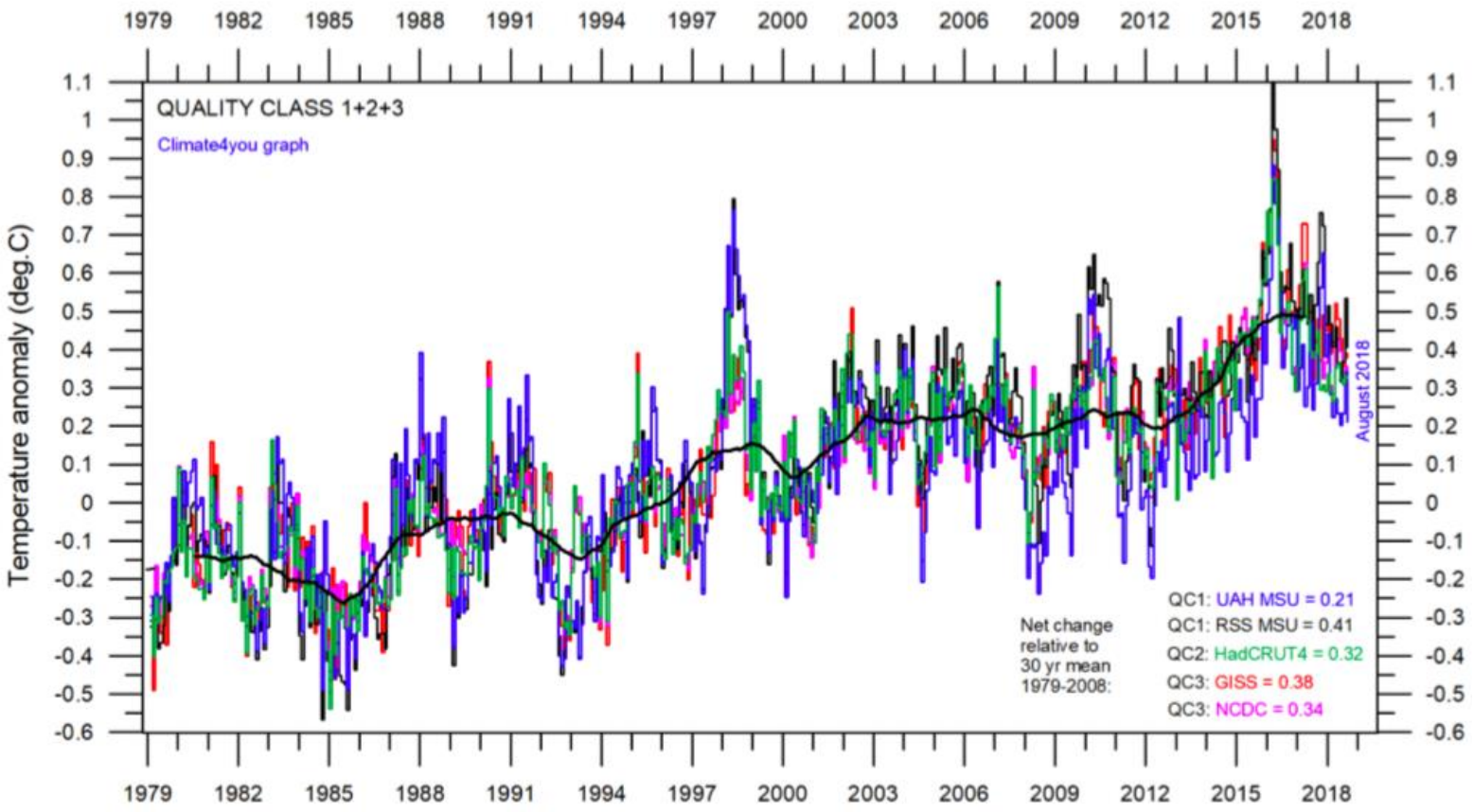
ILLUSTRATED

NEW YORK AND LONDON
HARPER & BROTHERS PUBLISHERS
MCMVIII


WORLDS
IN THE MAKING
THE EVOLUTION OF THE UNIVERSE
"By the influence of the increasing percentage of carbonic acid in the atmosphere, we may hope to enjoy ages with more equable and better climates."
MCMVIII

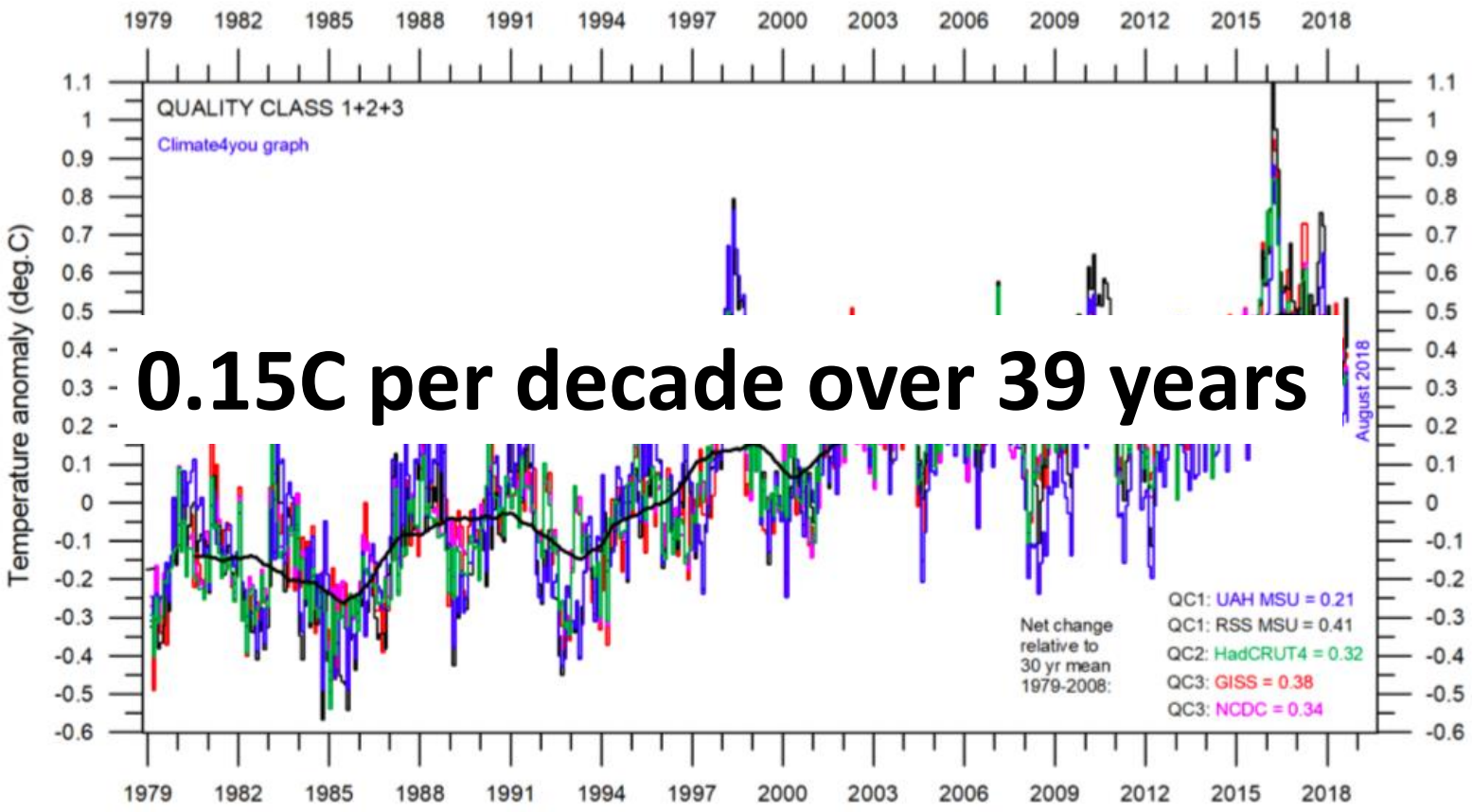
Global Warming

Global warming



Ole Humlum, http://www.climate4you.com

Global warming



Ole Humlum, http://www.climate4you.com

Based on current model results, we predict:

- under the IPCC Business-as-Usual (Scenario A) emissions of greenhouse gases, a rate of increase of global mean temperature during the next century of about 0 3°C per decade (with an uncertainty range of 0 2°C to 0 5°C per decade), this is greater than that seen over the past 10,000 years This will result in a likely increase in global mean temperature of about 1°C above the present value by 2025 and 3°C before the end of the next century The rise will not be steady because of the influence of other factors

IPCC, FAR, 1990, Summary for Policymakers, p 1

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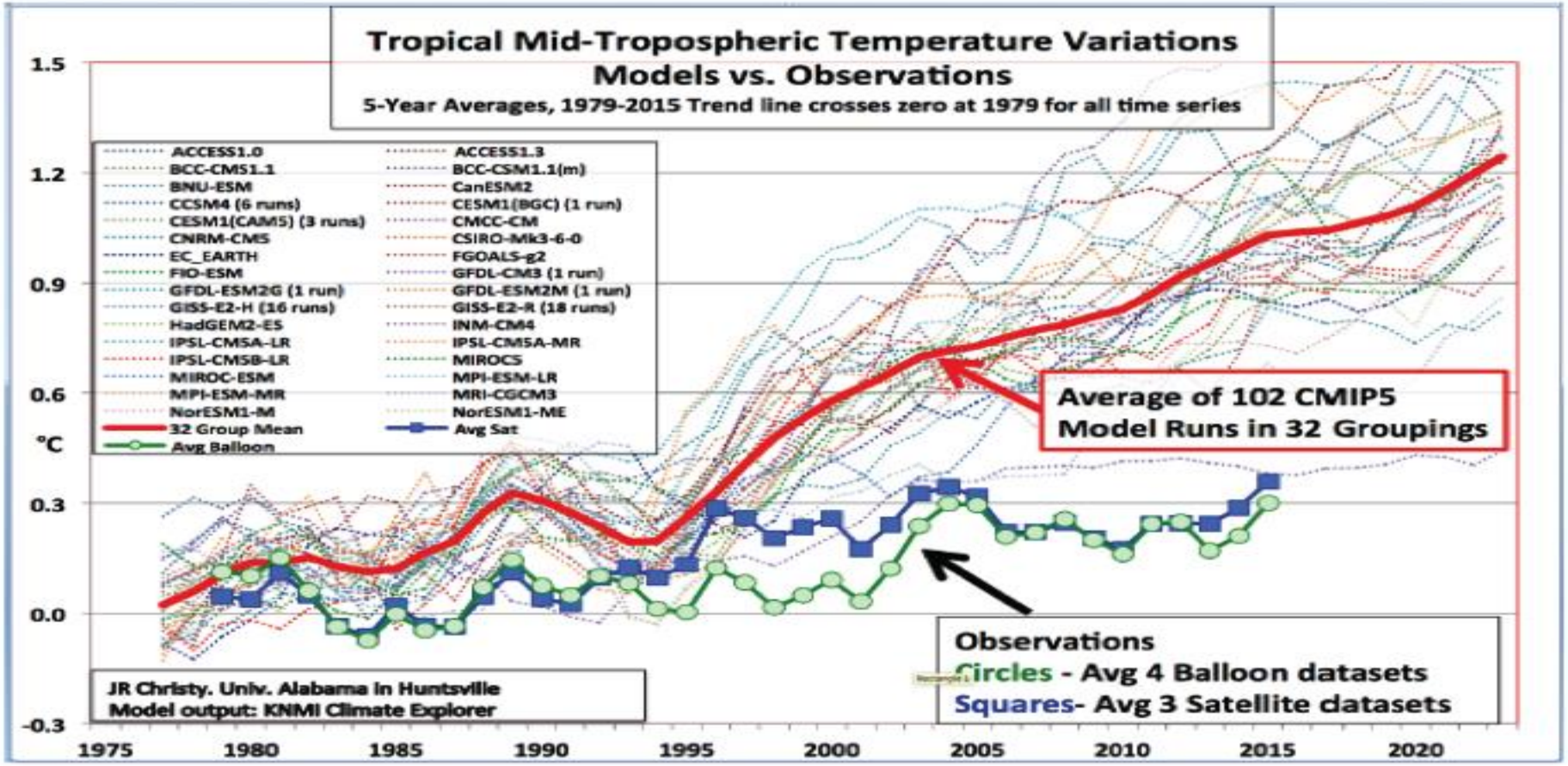
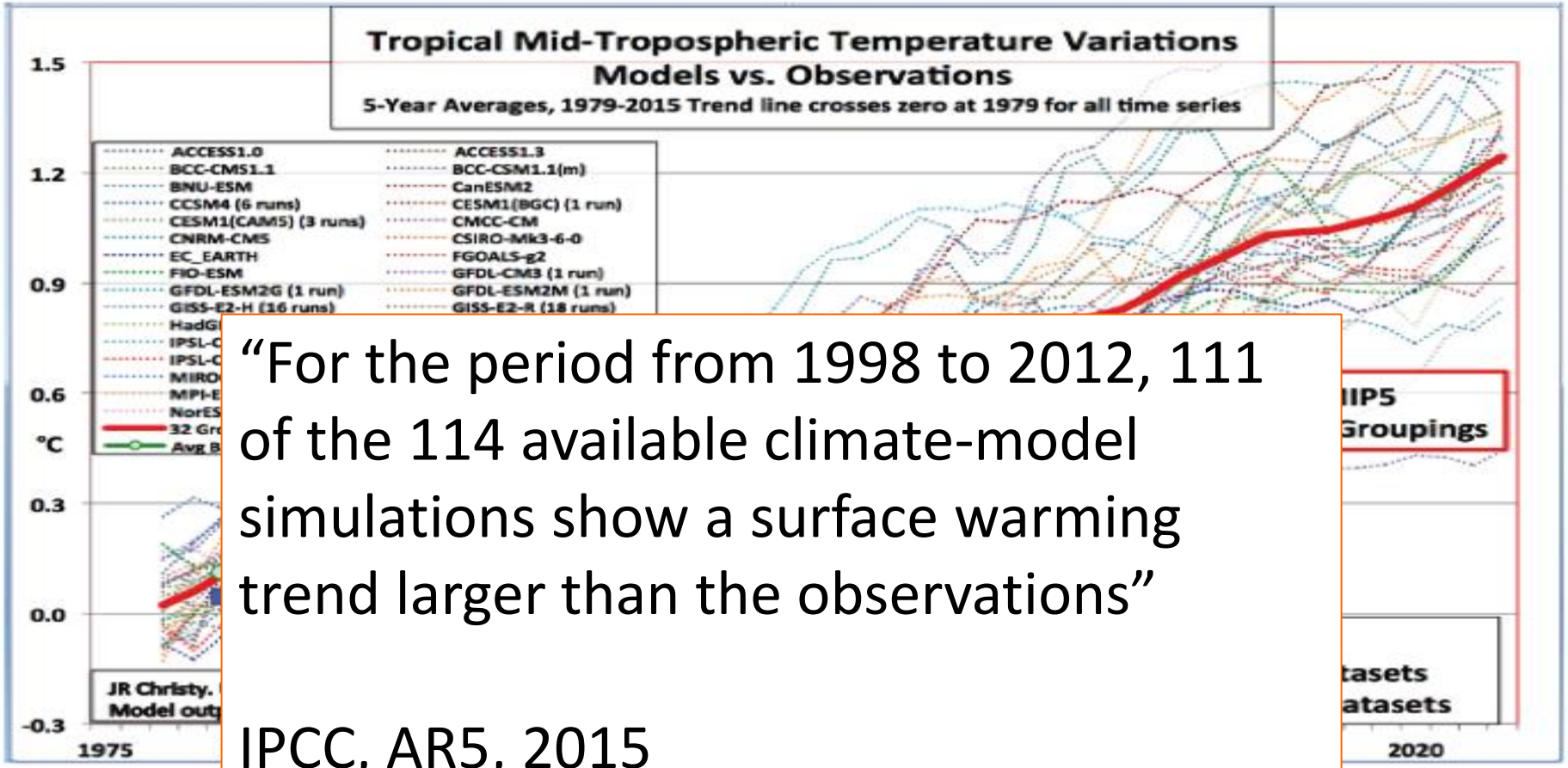
IPCC, FAR, 1990, Summary for Policymakers, p 1

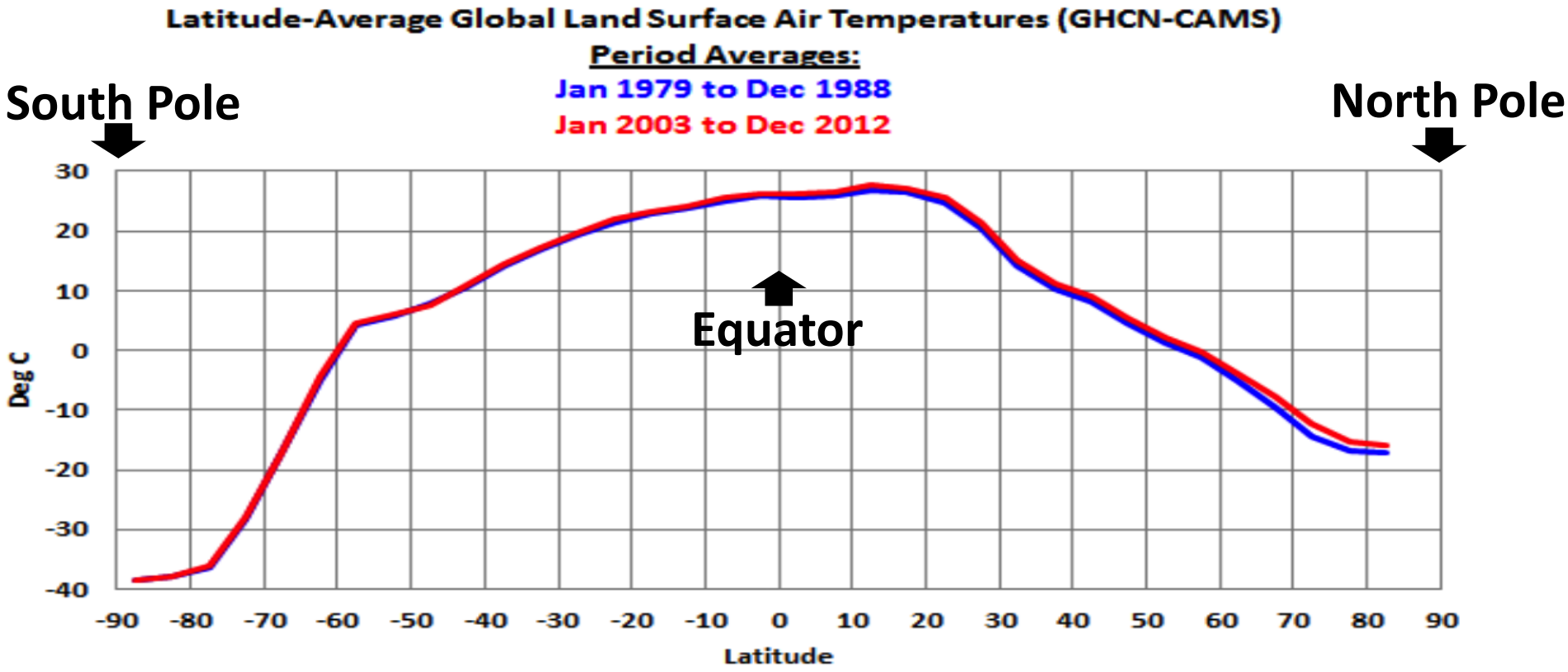

Tropical Mid-Tropospheric Temperature Variations
Models vs. Observations
5-Year Averages, 1979-2015 Trend line crosses zero at 1979 for all time series
ACCESS1.0
ACCESS1.3
BCC-CMS1.1
BCC-CSM1.1(m)
BNU-ESM
CanESM2
CCSM4 (6 runs)
CESM1(BGC) (1 run)
CESM1(CAM5) (3 runs)
CMCC-CM
CNRM-CM5
CSIRO-Mk3-6-0
EC_EARTH
FGOALS-g2
FIO-ESM
GFDL-CM3 (1 run)
GFDL-ESM2G (1 run)
GFDL-ESM2M (1 run)
GISS-E2-H (16 runs)
GISS-E2-R (18 runs)
HadGEM2-ES
INM-CM4
IPSL-CM5A-LR
IPSL-CM5A-MR
IPSL-CM5B-LR
MIROCS
MIROC-ESM
MPI-ESM-LR
MPI-ESM-MR
MRI-CGCM3
NorESM1-M
NorESM1-ME
32 Group Mean
Avg Sat
Avg Balloon
Average of 102 CMIP5
Model Runs in 32 Groupings
Observations
Circles - Avg 4 Balloon datasets
Squares- Avg 3 Satellite datasets
JR Christy. Univ. Alabama in Huntsville
Model output: KNMI Climate Explorer
°C
1.5
1.2
0.9
0.6
0.3
0.0
-0.3
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020



"For the period from 1998 to 2012, 111 of the 114 available climate-model simulations show a surface warming trend larger than the observations"

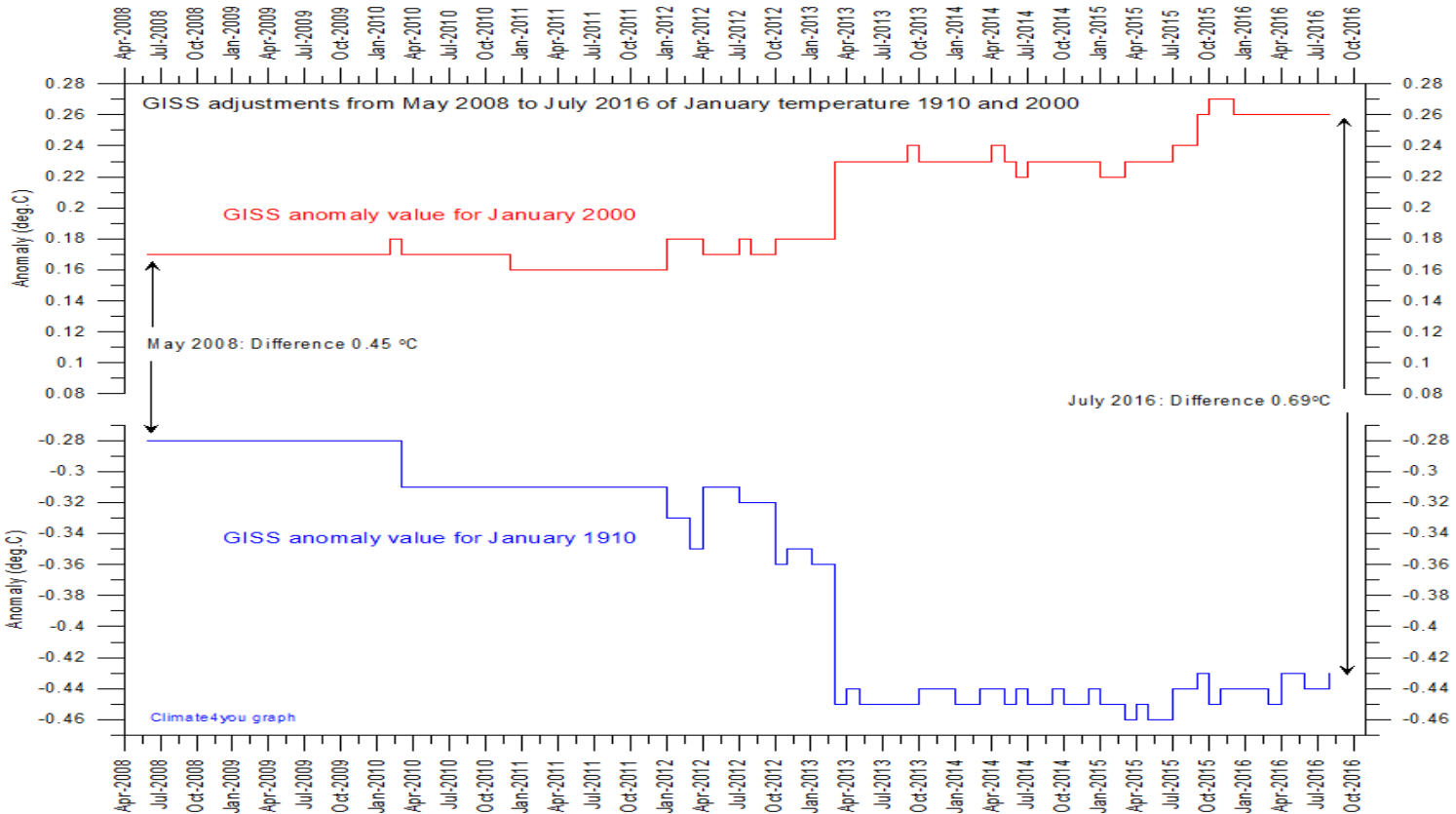
IPCC, AR5, 2015

Warming by latitude



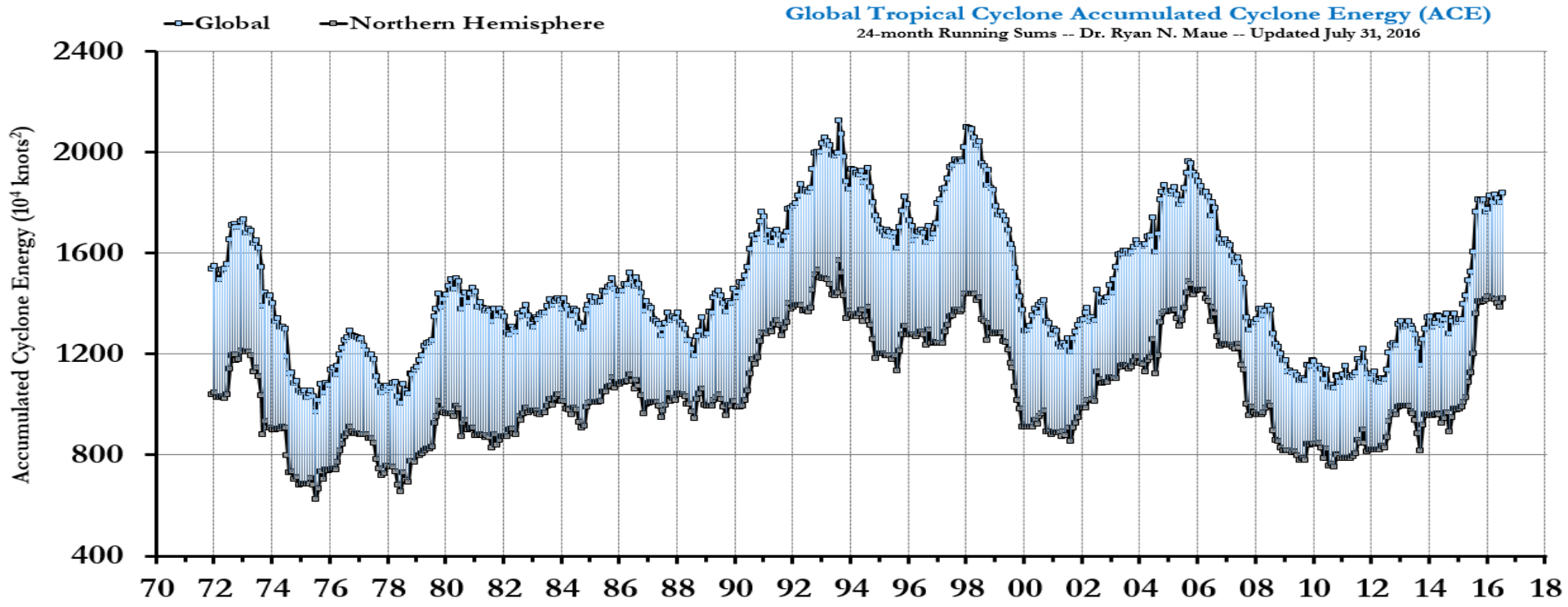
http://bobtisdale.files.wordpress.com/2014/05/figure-3.png

Thermometer adjustments

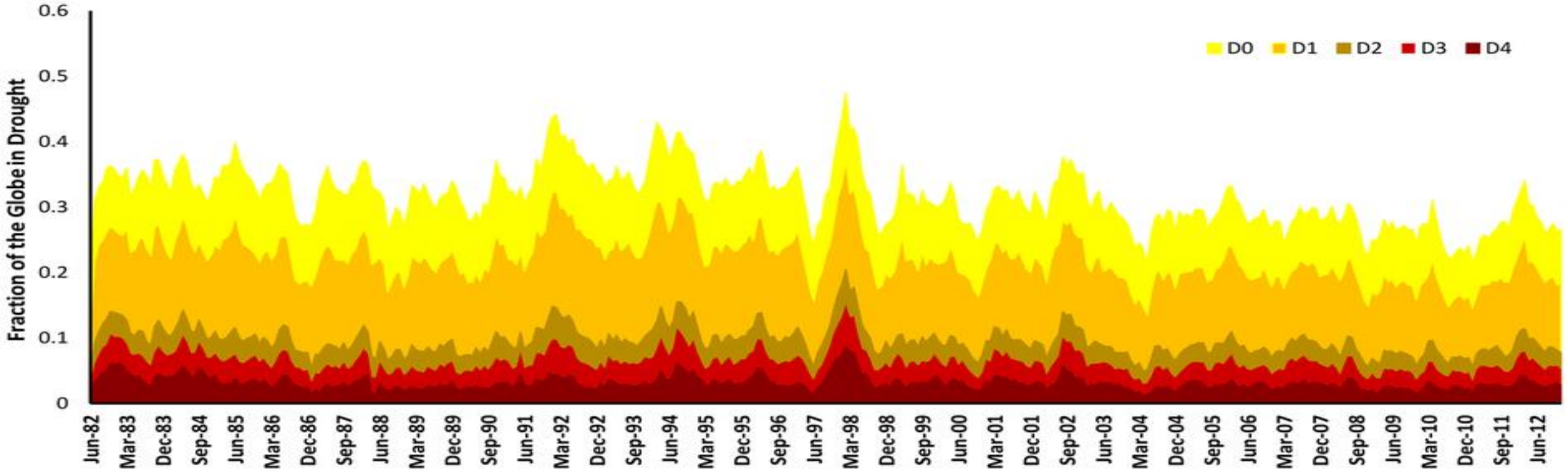


Impacts of climate change

Tropical cyclones



Drought


Fraction of the Globe in Drought
0.6
0.5
0.4
0.3
0.2
0.1
0
D0
D1
D2
D3
D4
Jun-82
Mar-83
Dec-83
Sep-84
Jun-85
Mar-86
Dec-86
Sep-87
Jun-88
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Sep-08
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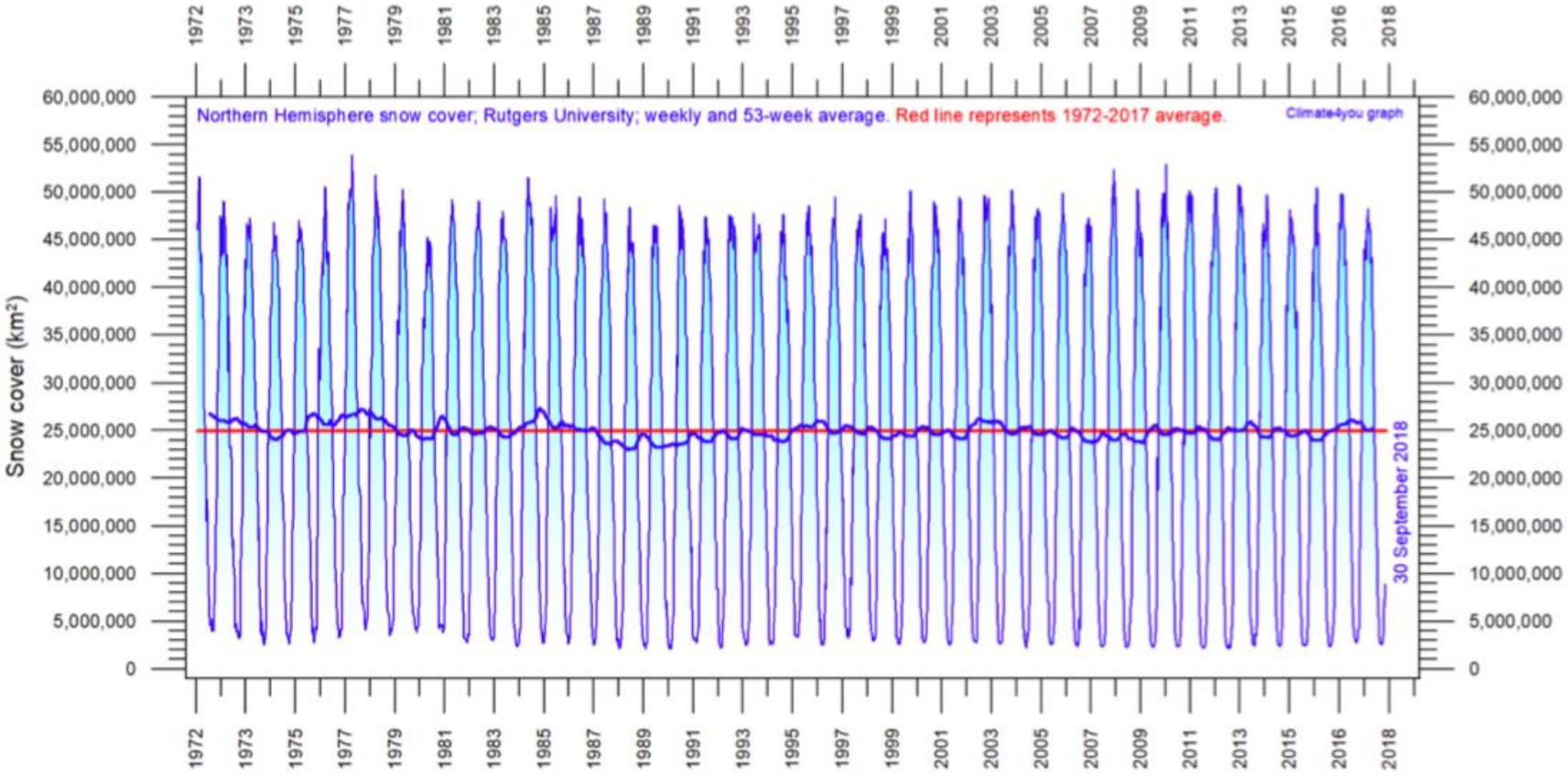
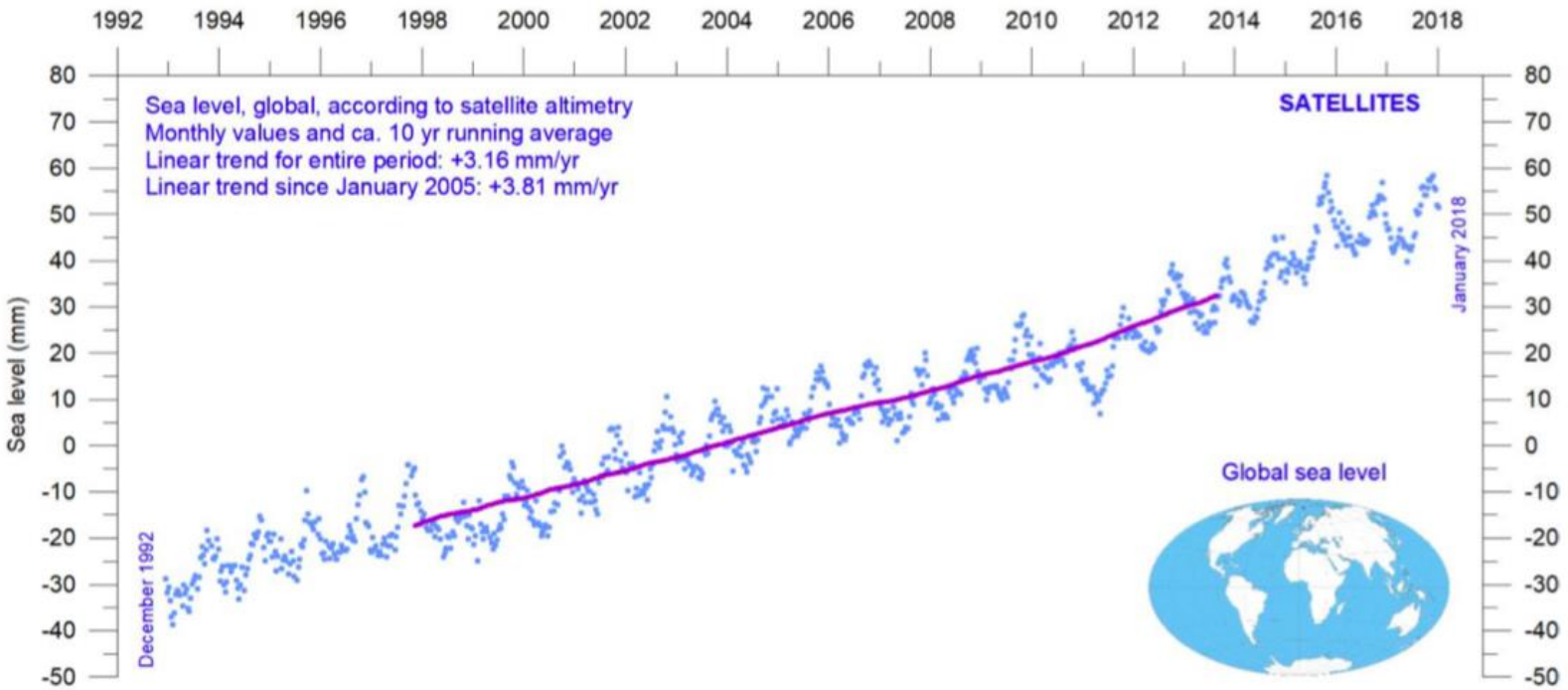
Mar-10
Dec-10
Sep-11
Jun-12

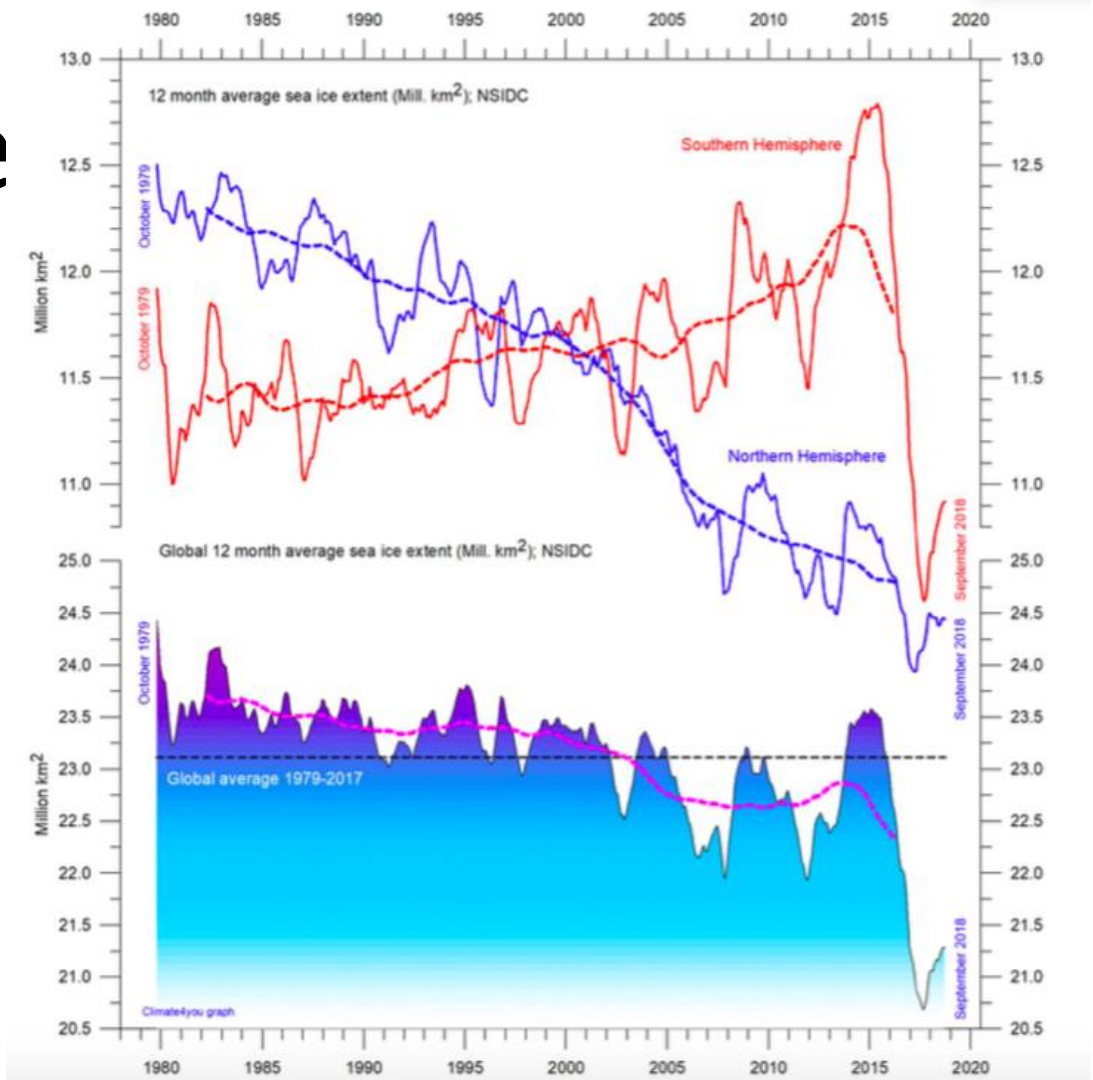
Snow cover


Northern Hemisphere snow cover; Rutgers University; weekly and 53-week average. Red line represents 1972-2017 average.
Climate4you graph
Snow cover (km²)
60,000,000
55,000,000
50,000,000
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
1972
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2016
2018
30 September 2018

Sea level rise – 3.16 mm a year



Sea Ice



National Snow and Ice Data Center

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4874420/

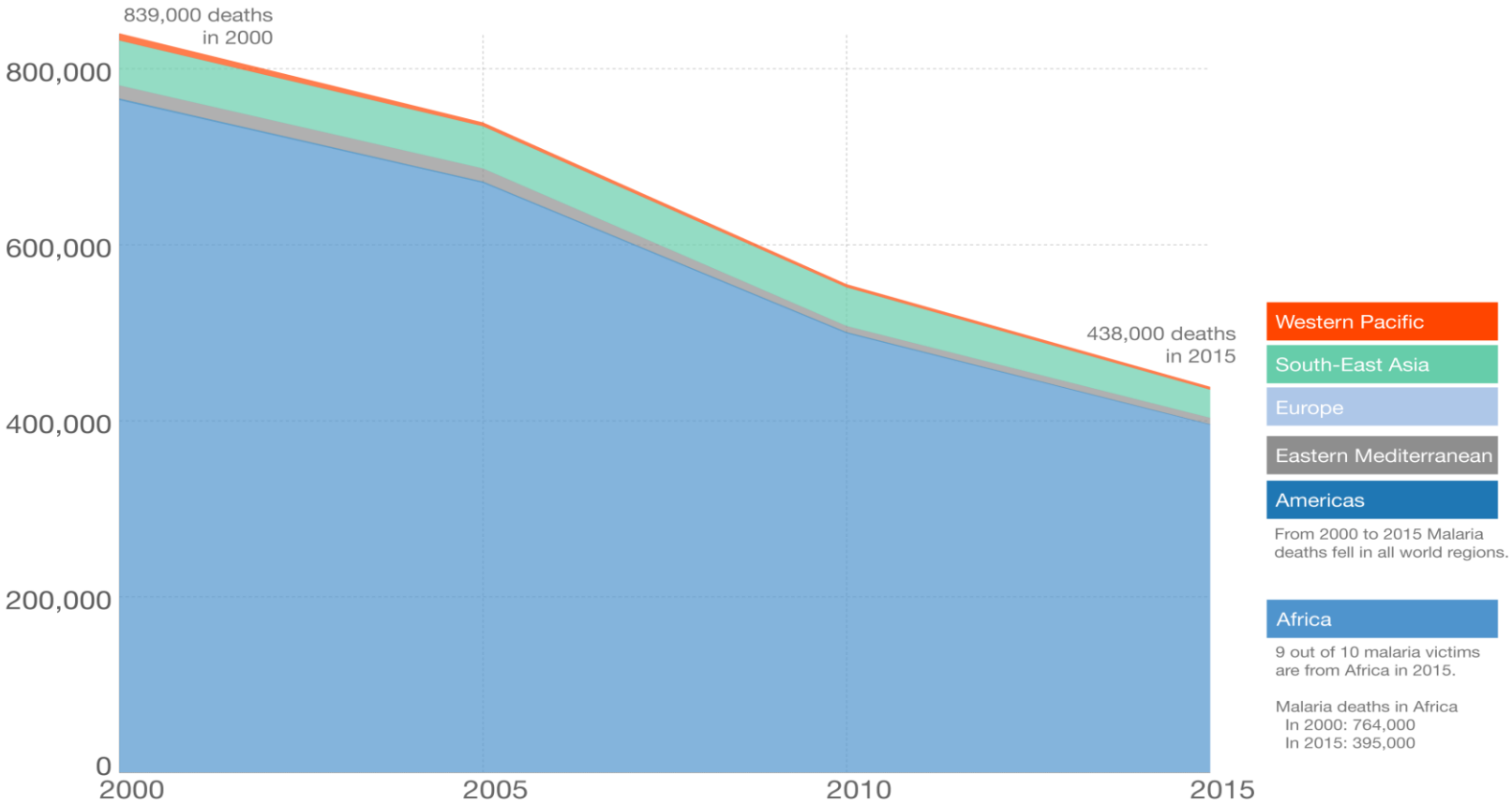
"Global area burned appears to have overall declined over past decades, and there is increasing evidence that there is less fire in the global landscape today than centuries ago."

Doerr and Santin 2016, Phil Trans Roy Soc

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4874420/

Global malaria deaths by world region, 2000 to 2015

Our World in Data

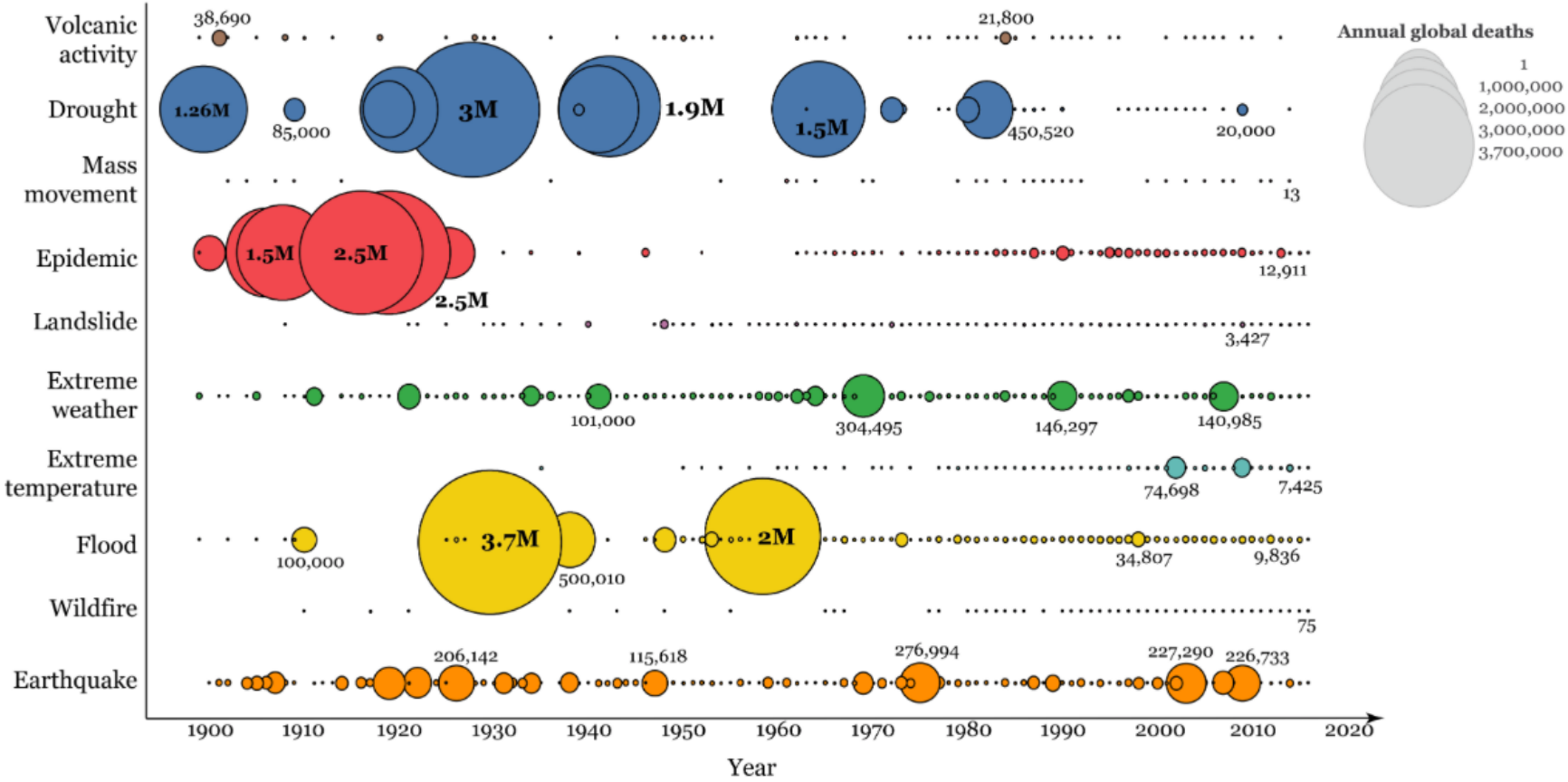


Data obtained from: WHO

Global deaths from natural disasters, by type (1900-2016)

Global annual deaths from natural catastrophes, differentiated by disaster type from 1900 to 2016.
The size of the bubble represents the total death count per year.

Our World in Data



Data source: EMDAT (2017): OFDA/CRED International Disaster Database, Université catholique de Louvain – Brussels – Belgium.
The data visualization is available at OurWorldinData.org. There you find research and more visualizations on this topic.

UNEP's "disappeared" forecast

"Humanity is sitting on a time bomb. If the vast majority of the world's scientists are right, we have just ten years to avert a major catastrophe that could send our entire planet's climate system into a tail-spin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced - a catastrophe of our own making."

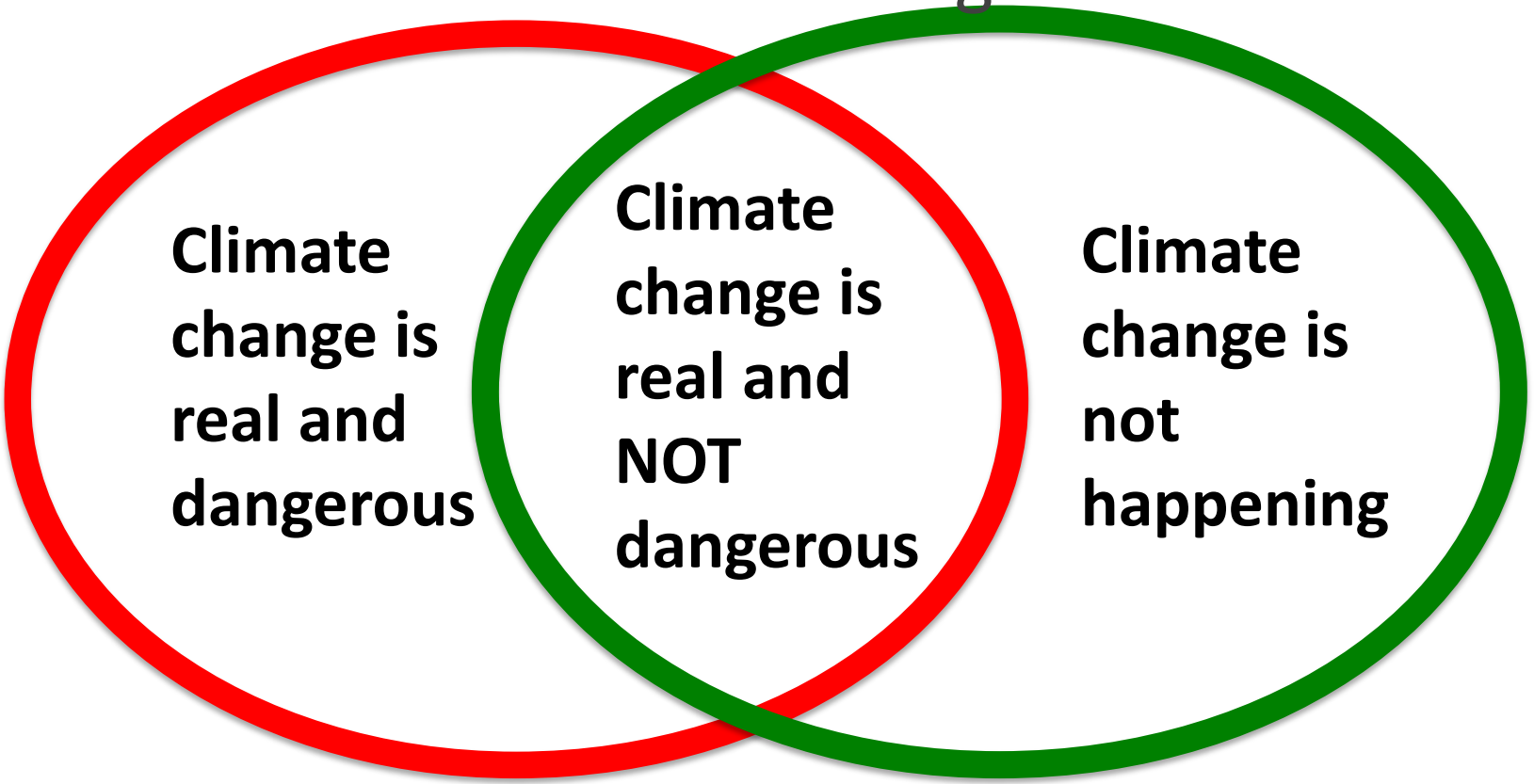
Al Gore 2006

Failed climate forecasts

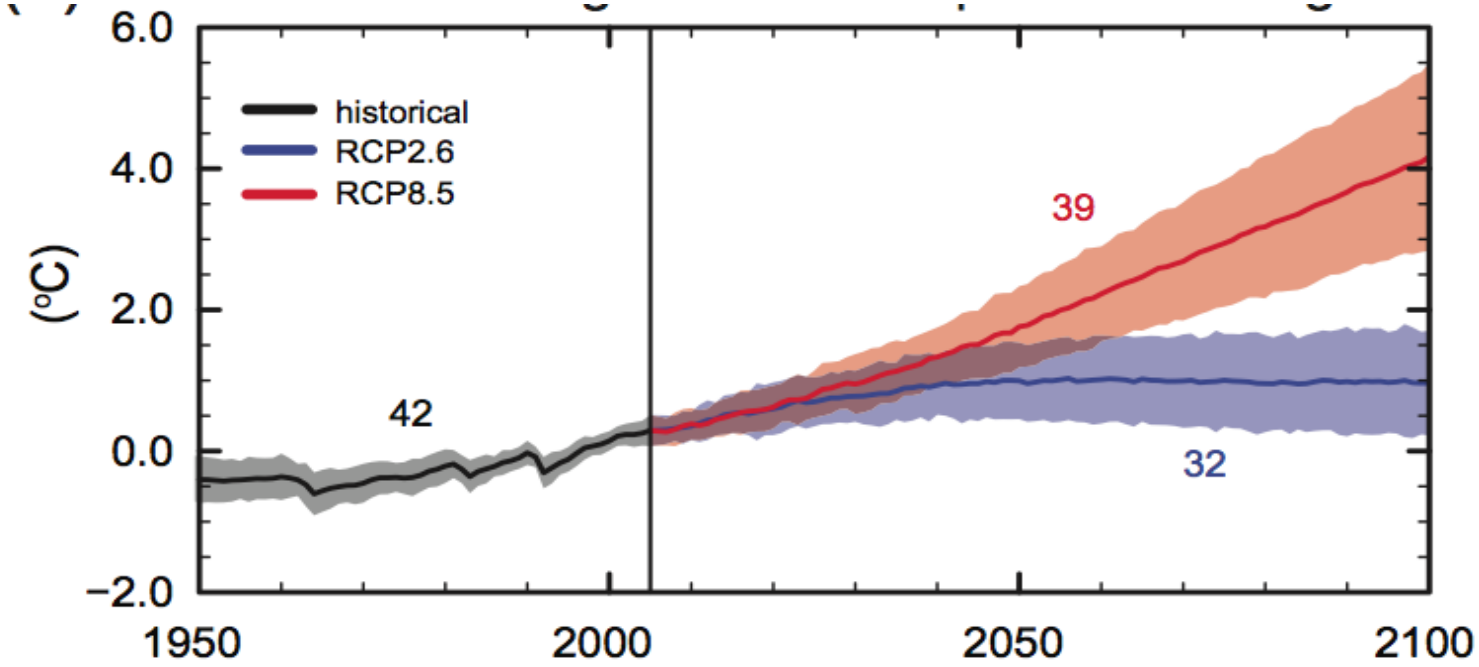
- malaria would increase
- snow would become a thing of the past
- hurricanes/cyclones would get worse
- droughts would get worse
- the Arctic sea ice would be gone by 2013
- glacier retreat would accelerate
- sea level rise would accelerate
- the Gulf Stream would fail
- 50m climate refugees by 2010

Luke-warming

Lukewarming



A range of possible outcomes



http://www.springerlink.com/content/f296645337804p75/fulltext.html#CR11

“Even the vaunted scientific consensus around climate change — which largely rests on fundamental physics that has been well understood for more than a century — applies only to a narrow claim about the discernible human impact on global warming. The minute you get into questions about the rate and severity of future impacts, or the costs of and best pathways for addressing them, no semblance of consensus among experts remains.”
Professor Daniel Sarewitz, Professor of science and society at Arizona State University

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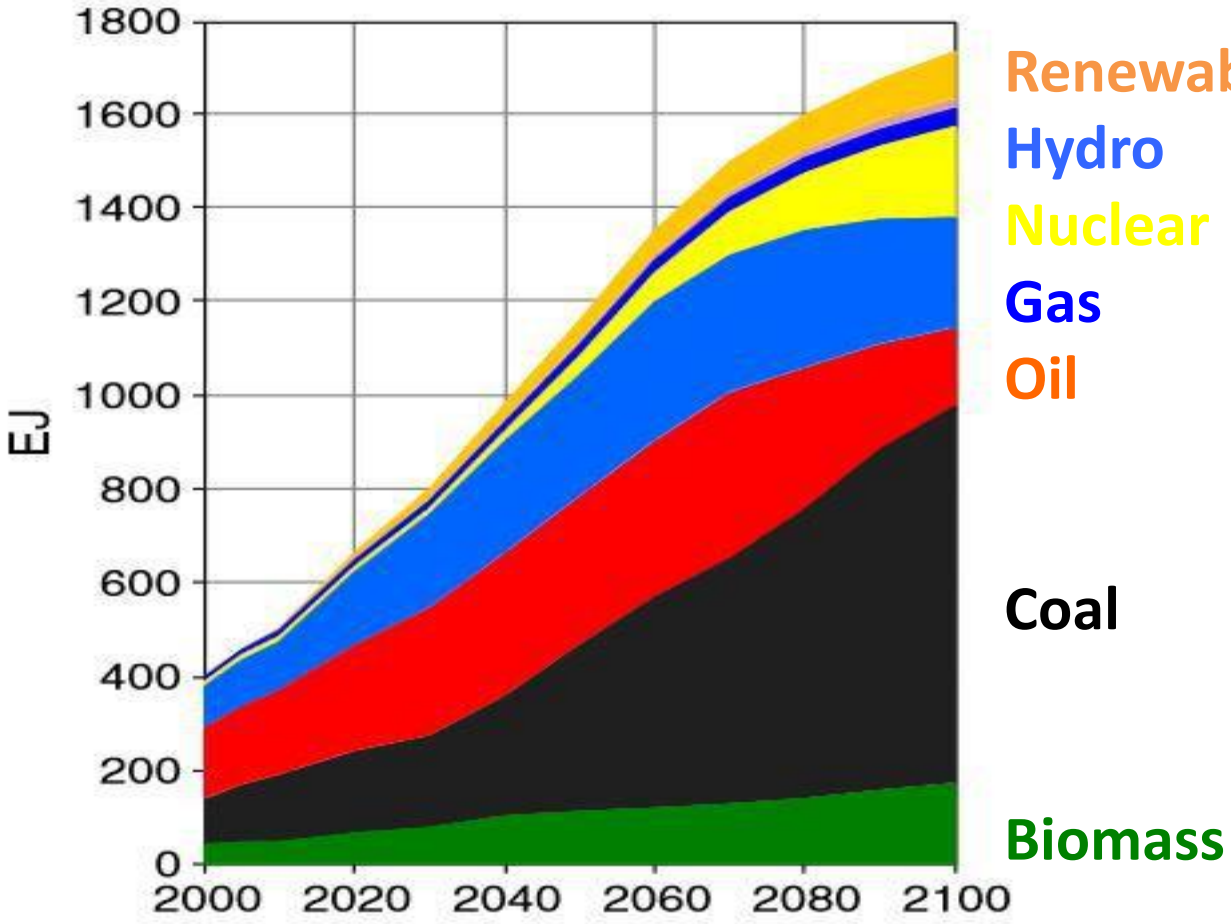
Professor Daniel Sarewitz, Professor of science and society at Arizona State University

Only one scenario is dangerous – and then only with high sensitivity

Scenario	Warming in 2081–2100 based on:			
	CMIP5 models		TCR of 1.35°C	
	°C	°C	°C	°C
Baseline	1850–1900	2012*	1850–1900*	2012
RCP2.6	1.6	0.8	1.0	0.2
RCP4.5	2.4	1.6	1.6	0.8
RCP6.0	2.8	2.0	2.0	1.2
RCP8.5	4.3	3.5	2.9	2.1

Lewis and Crok 2013

RCP 8.5 Global energy assumptions



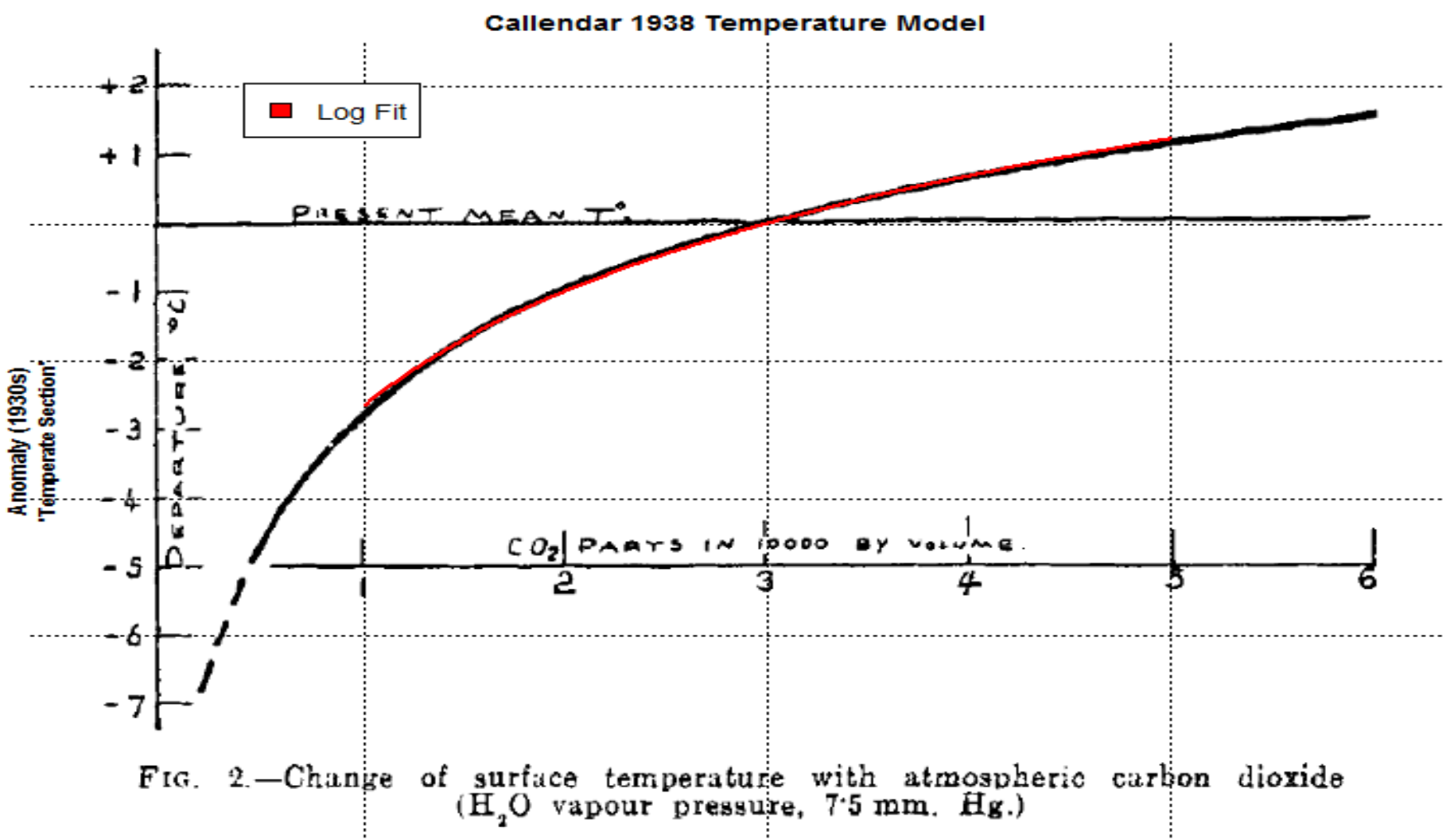
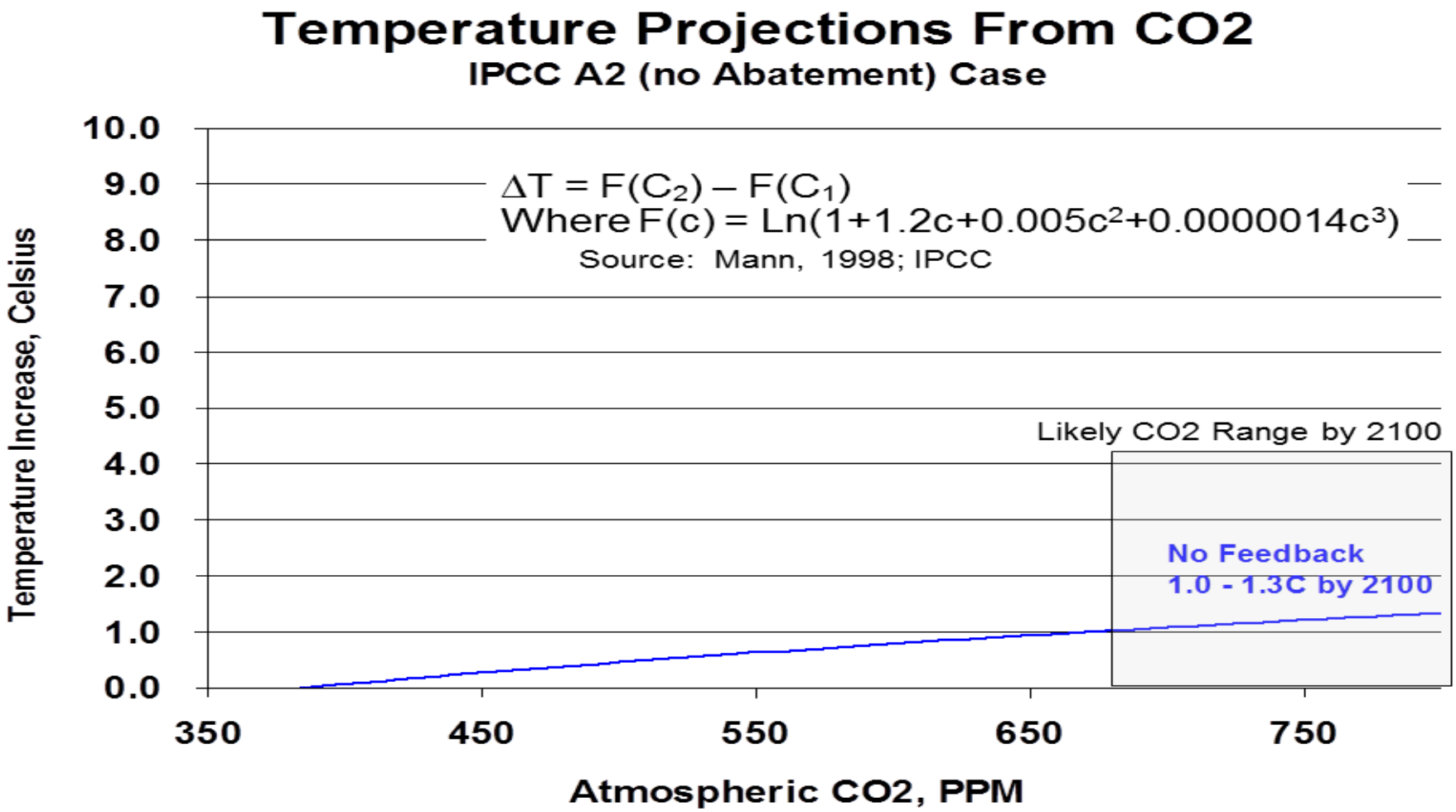
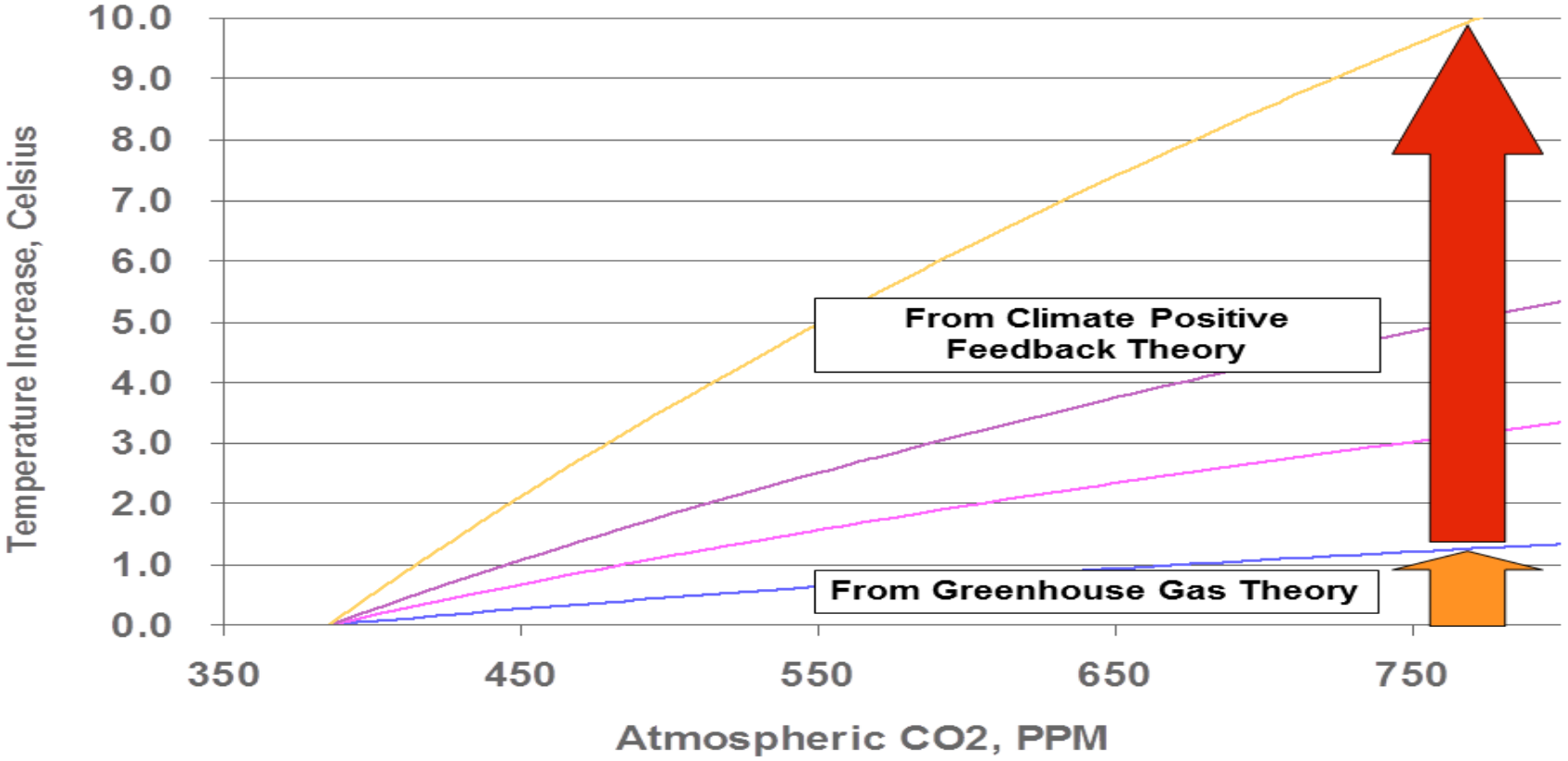


FIG. 2.—Change of surface temperature with atmospheric carbon dioxide (H_2O vapour pressure, 7·5 mm. Hg.)



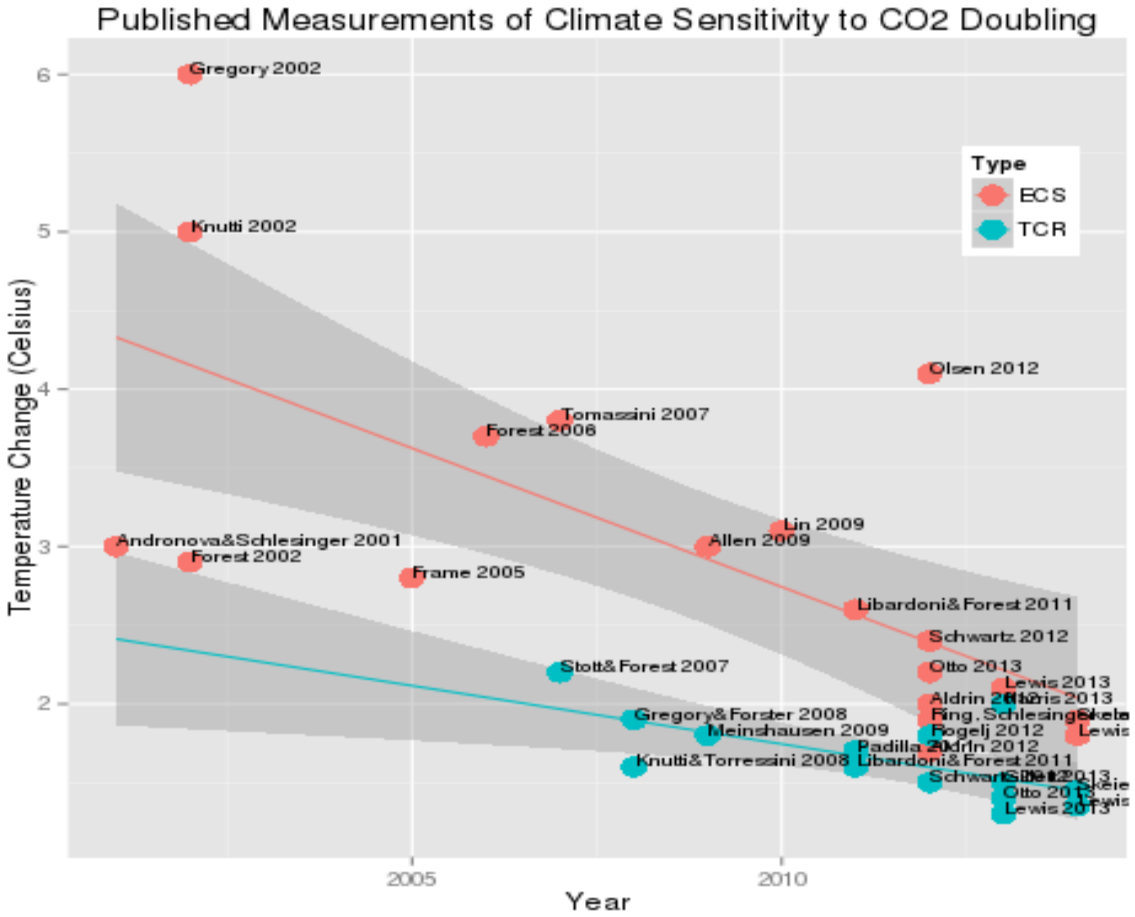
http://blogs-images.forbes.com/warrenmeyer/files/2014/02/2013-Version-3-Climate-talk1.png

Catastrophic Global Warming Theory Based on Two Chained Theories



http://blogs-images.forbes.com/warrenmeyer/files/2014/02/2013-Version-3-Climate-talk2.png

Climate sensitivity



Sensitivity in models 2.6-4.1C

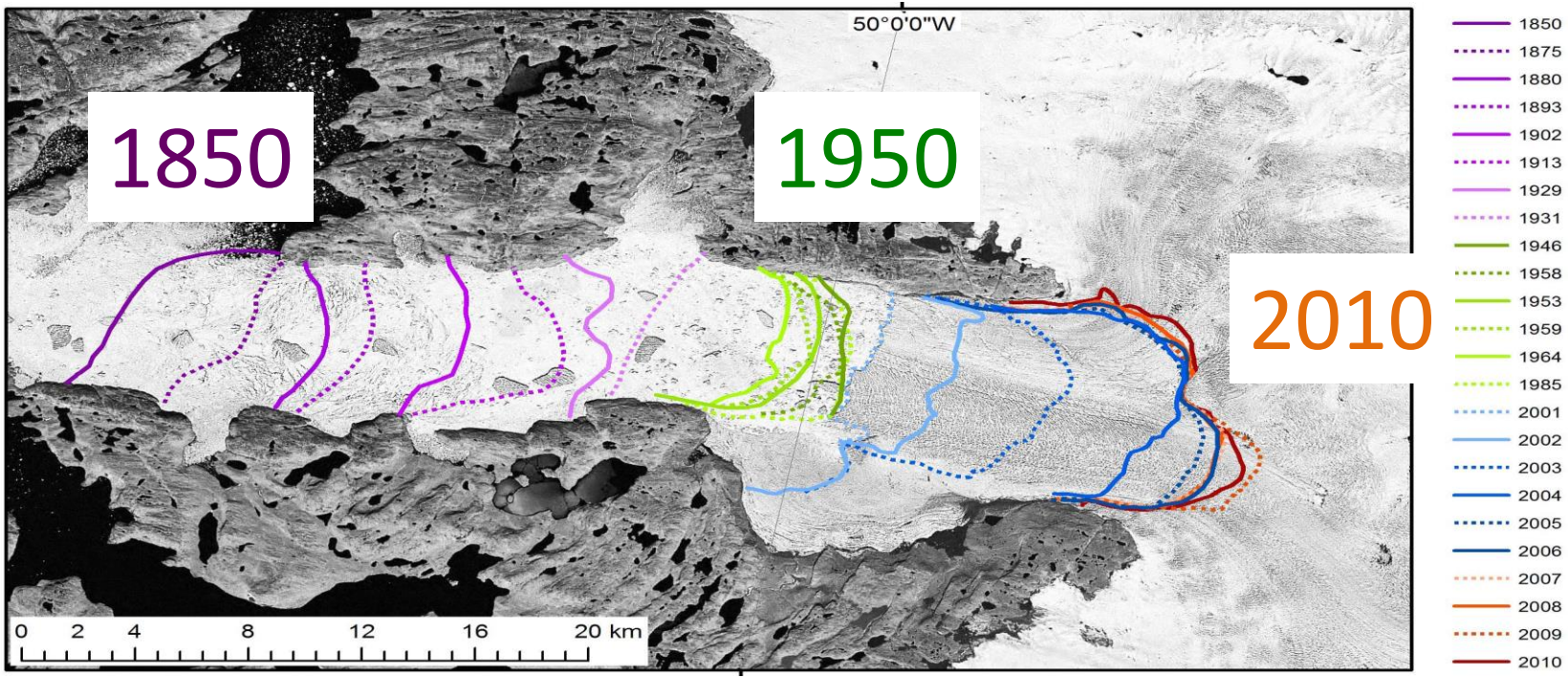
https://landshape.files.wordpress.com/2015/06/climate_sensitivity5.png

"The findings of the Resplandy et al paper were peer reviewed and published in the world's premier scientific journal and were given wide coverage in the English-speaking media. Despite this, a quick review of the first page of the paper was sufficient to raise doubts as to the accuracy of its results. Just a few hours of analysis and calculations, based only on published information, was sufficient to uncover apparently serious (but surely inadvertent) errors in the underlying calculations."

Nic Lewis, 6 Nov 2018

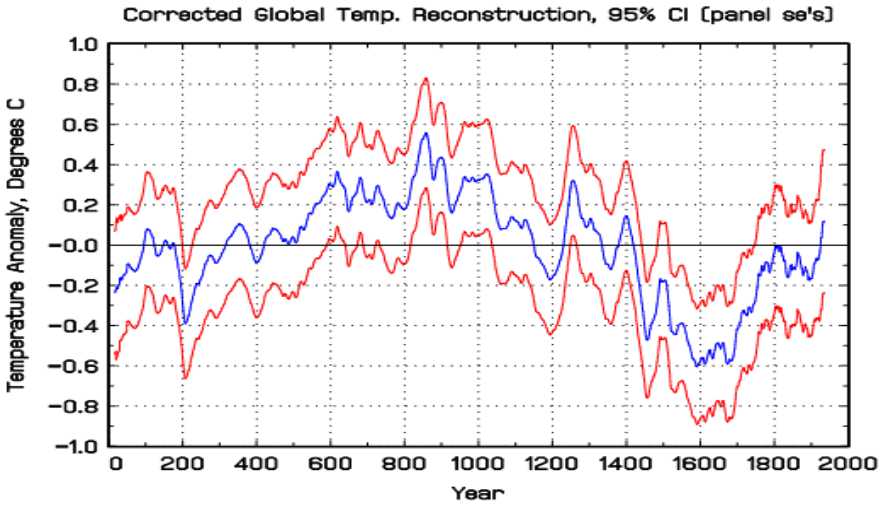
Natural climate change

Jakobshavn isbrae, Greenland: retreating since 1850



http://www.buffalo.edu/content/dam/www/news/imported/hires/jakobs_retreat1.jpg

Medieval Warm Period



18 non-tree-ring proxies

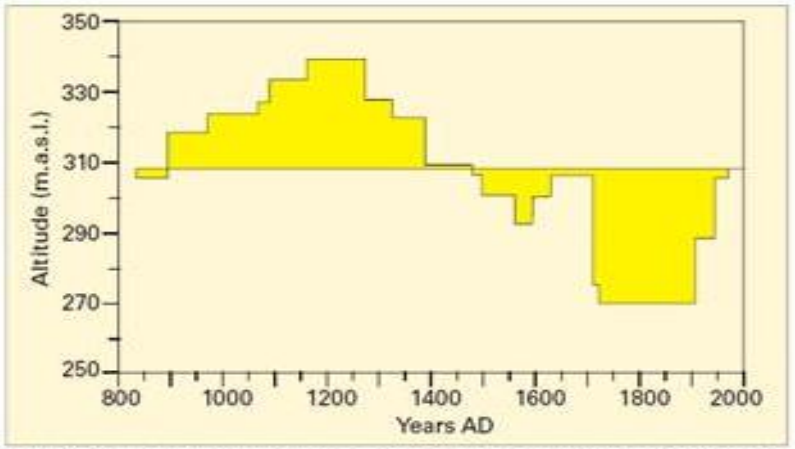
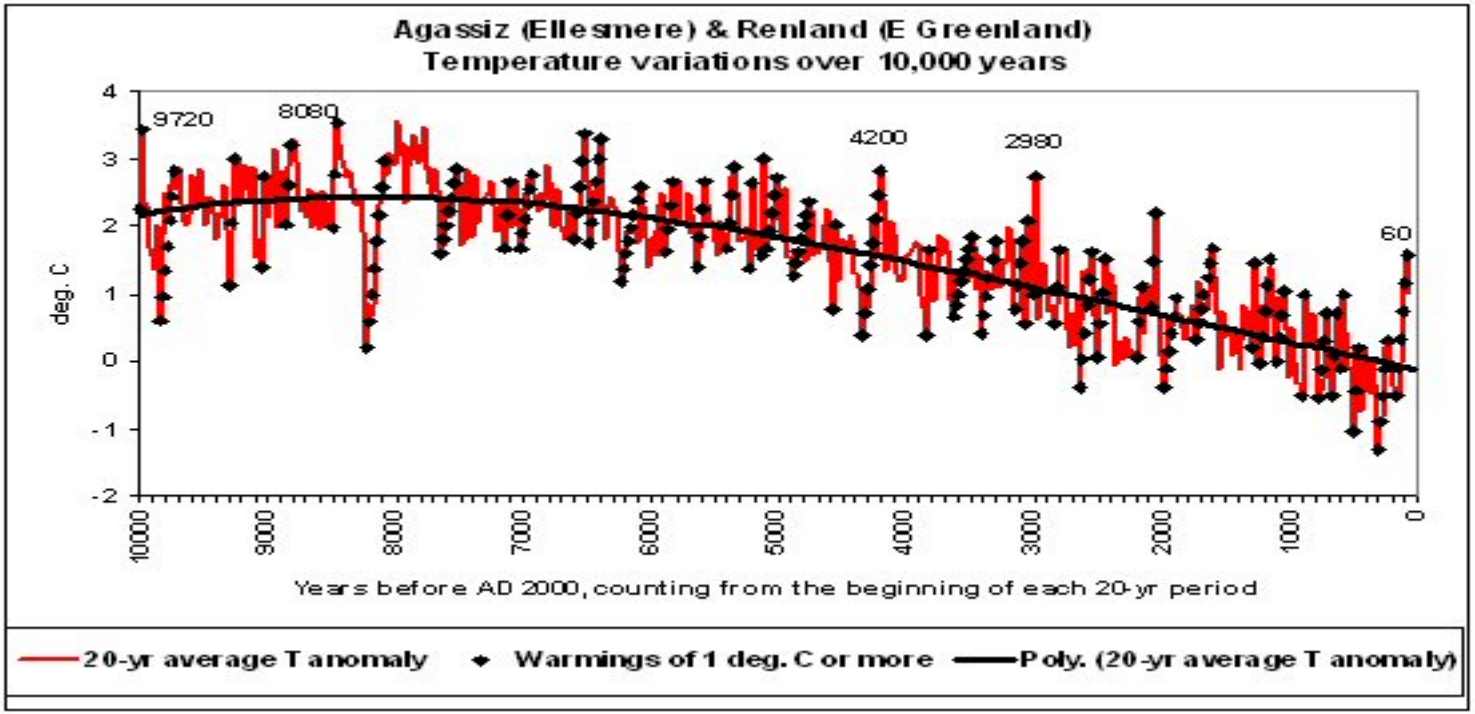


Fig. 1. Altitudinal displacement of the upper treeline in the Polar Ural Mountains during the last 1150 years.

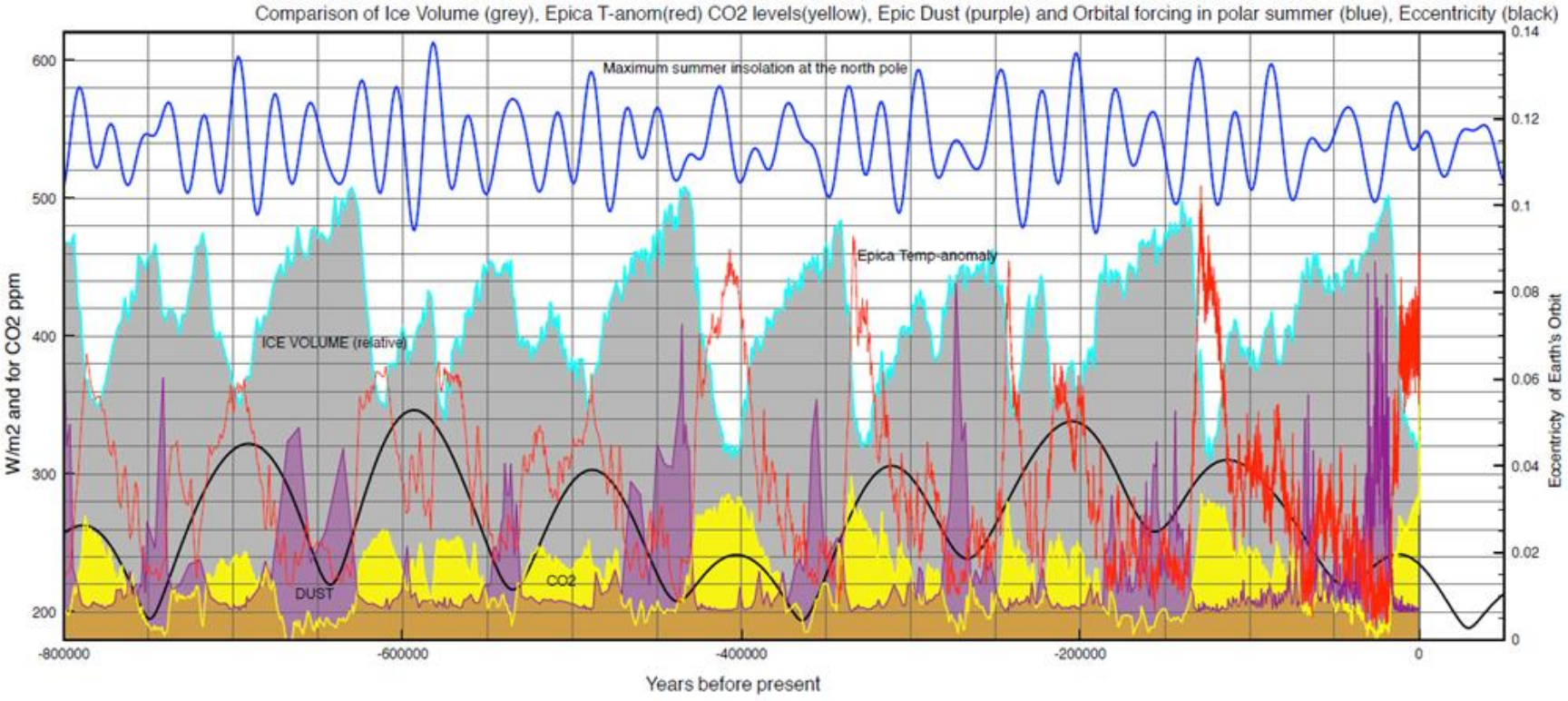
Polar Ural tree-line

Loehle, C. and J.H. McCulloch. 2008. *Energy and Environment*, **19**, 93-100

The past 10,000 years in Greenland



https://calderup.wordpress.com/2010/05/06/warming-of-greenland/



A summary graph of all the factors that play a role in glacial modulation.

Ice sheet extent grows (light blue), forcing the temperature to fall (red). And CO_2 concentrations (yellow) fall alongside temperatures, as CO_2 is absorbed by the cooler oceans. When CO_2 concentrations reach a minimum of 190 ppm there is desertification and large dust storms (purple). And when the next Great Summer comes along (blue sine wave), the dusty-ice sheets can melt and the world warms into another interglacial (red peaks). Sources: Laskar 2004 orbital cycles, Epica3 2007 temperature data

http://www.academia.edu/20051643/Modulation_of_Ice_Ages_via_Precession_and_Dust-Albedo_Feedbacks

Scepticism

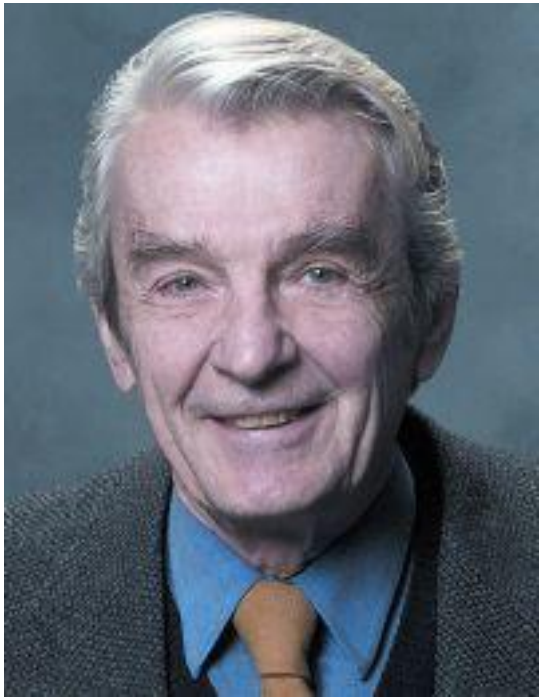
Matt Ridley wants to gamble the Earth's future because he won't learn from the past

Ridley argues against climate action because he believes zombie myths

People dressed as zombies which, like some myths about climate change, keep coming back from the dead. Photograph: Yuya Shino/Reuters

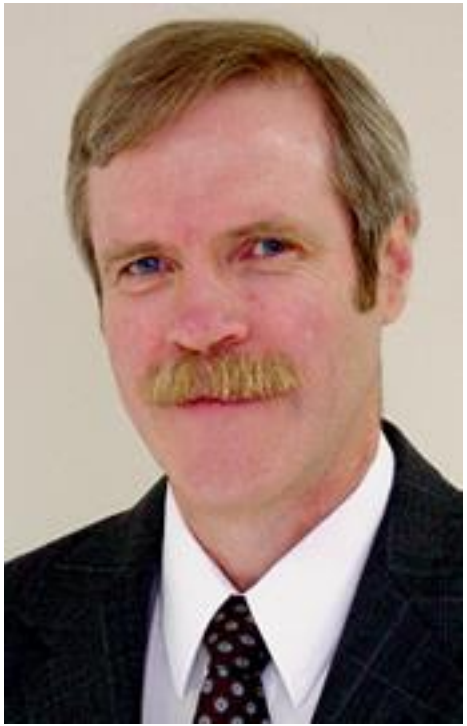
“In the APS it is ok to discuss whether the mass of the proton changes over time and how a multi-universe behaves, but the evidence of global warming is incontrovertible?”

Professor Ivar Giaever, resigning from the American Physical Society, 2011



“I looked at 73 climate models going back to 1979 and every single one predicted more warming than happened in the real world.”

John Christy, University of Alabama, Huntsville



“If you fund scientists to find evidence of something, they will be happy to find it for you. For over 20 years we have been funding them to find evidence of the human influence on climate. And they dutifully found it everywhere, hiding under every rock, glacier, ocean, and in every cloud, hurricane, tornado, raindrop, and snowflake. So, just tell scientists 20% of their funds will be targeted for studying natural sources of climate change. They will find those, too.”

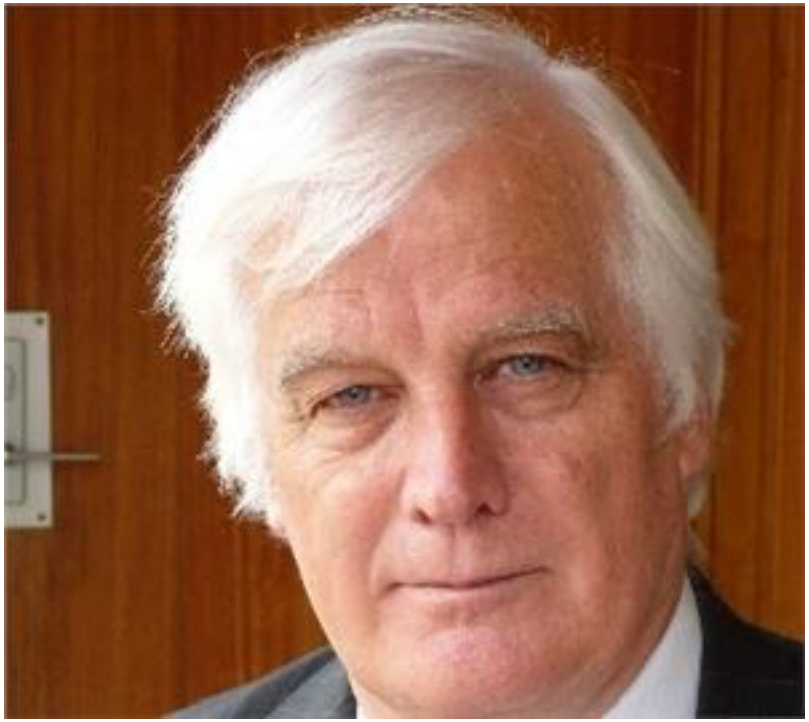
Roy Spencer, NASA

“Motivated by the precautionary principle to avoid dangerous anthropogenic climate change, attempts to modify the climate through reducing CO2 emissions may turn out to be futile.”

Professor Judith Curry,
Georgia Tech

"The IPCC process is related to environmental activism, politics and opportunism…The IPCC process is unrelated to science”

Ian Plimer, University of Melbourne



“I have been put under such an enormous group pressure in recent days from all over the world that has become virtually unbearable to me. If this is going to continue I will be unable to conduct my normal work and will even start to worry about my health and safety. I see therefore no other way out therefore than resigning from GWPF.”

Professor Lennart Bengtsson 2014

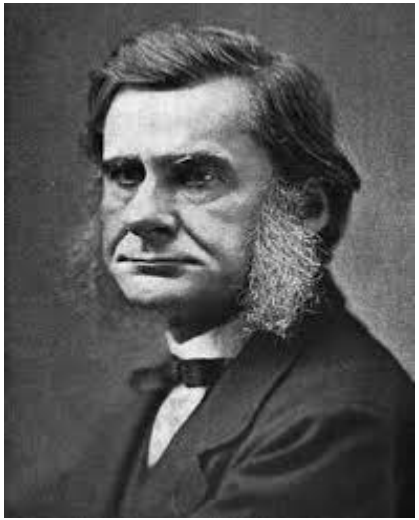
“An implausible conjecture backed by false evidence and repeated incessantly has become politically correct ‘knowledge,’ and is used to promote the overturn of industrial civilization. What we will be leaving our grandchildren is not a planet damaged by industrial progress, but a record of unfathomable silliness as well as a landscape degraded by rusting wind farms and decaying solar panel arrays. False claims about 97% agreement will not spare us, but the willingness of scientists to keep mum is likely to much reduce trust in and support for science.”

Richard Lindzen 2018.

Richard S. Lindzen was Alfred P. Sloan Professor of Meteorology at the Massachusetts Institute of Technology until his retirement in 2013.

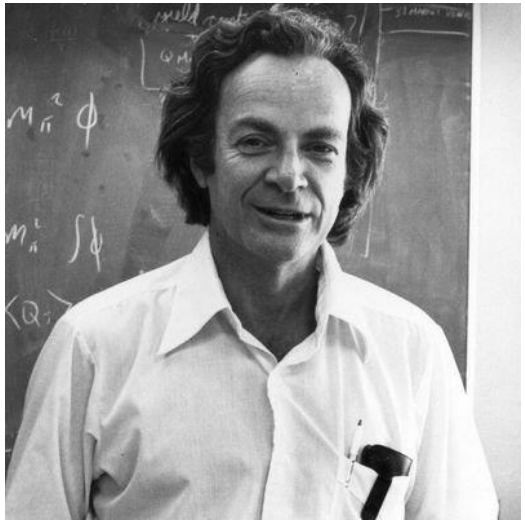
“The improver of natural knowledge absolutely refuses to acknowledge authority, as such. For him, scepticism is the highest of duties; blind faith the one unpardonable sin.”

Thomas Henry Huxley



“Science is the belief in the ignorance of experts.”

Richard Feynman 1966



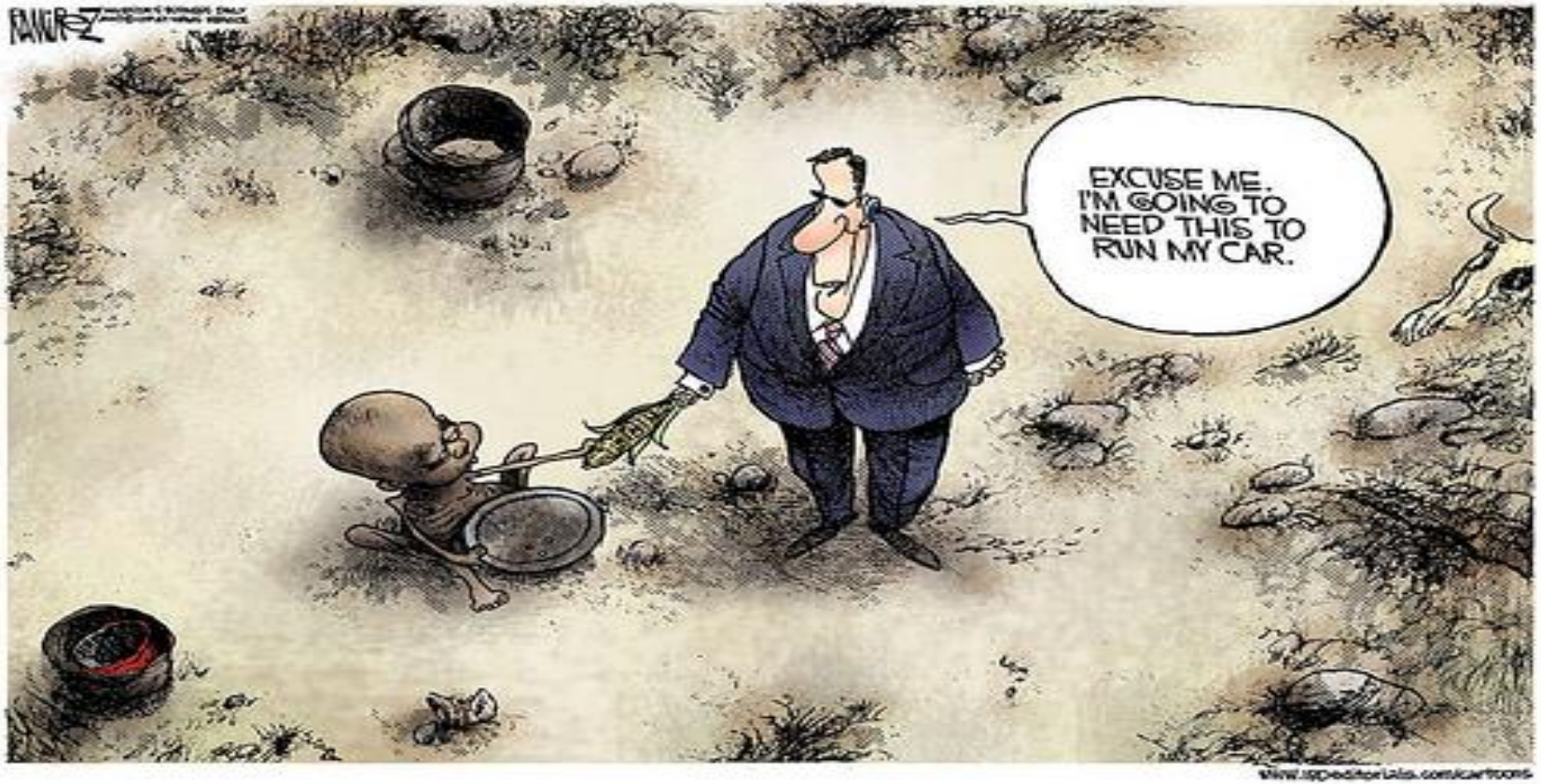
Why it matters

STUDENTS STUDYING UNDER STREETLIGHTS

+ PAUL ROMER

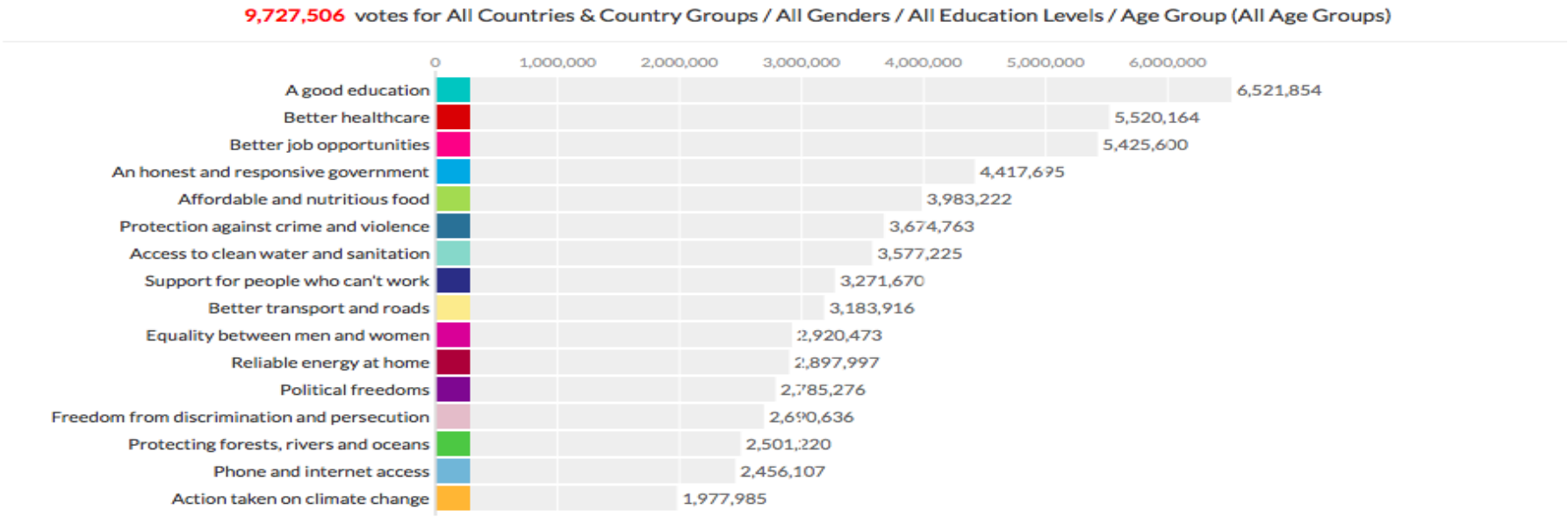

EDEN
SCHOOL BUS

Turning food into fuel

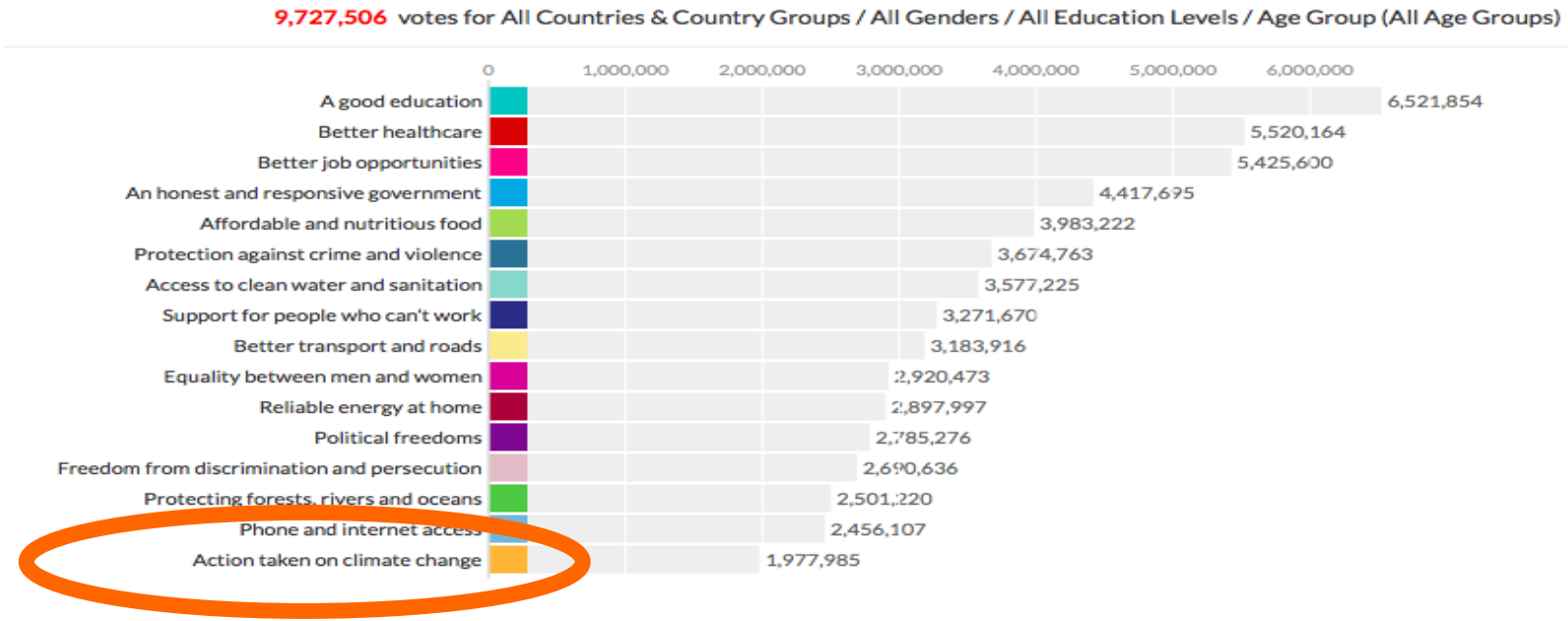


Michael Ramirez

A global poll

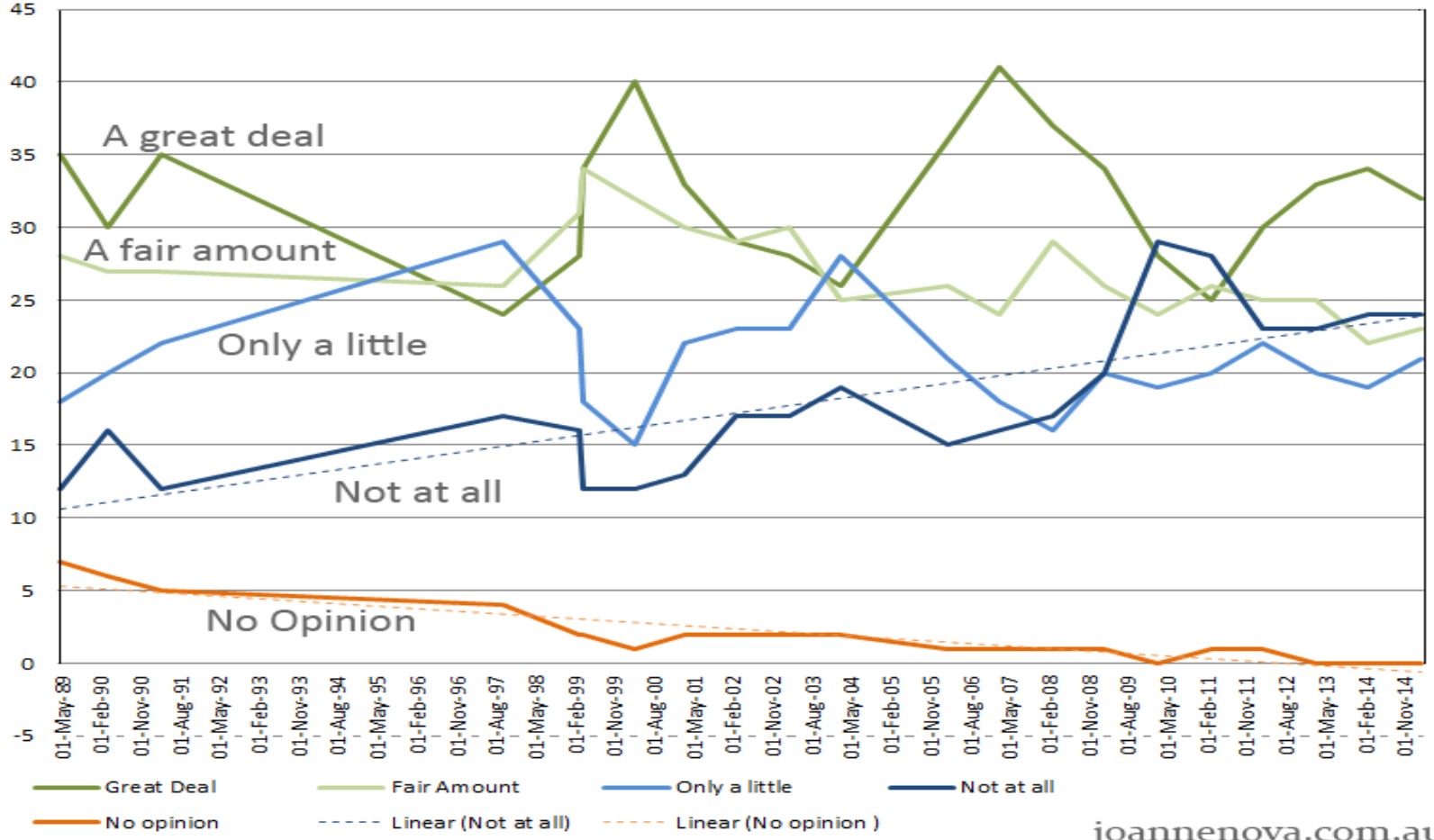


A global poll



"How much do you personally worry about global warming/climate change"

Gallup Poll 1989 - 2015



joannenova.com.au

The End