

Explaining Extreme Weather Events: Challenges in Climate Communication

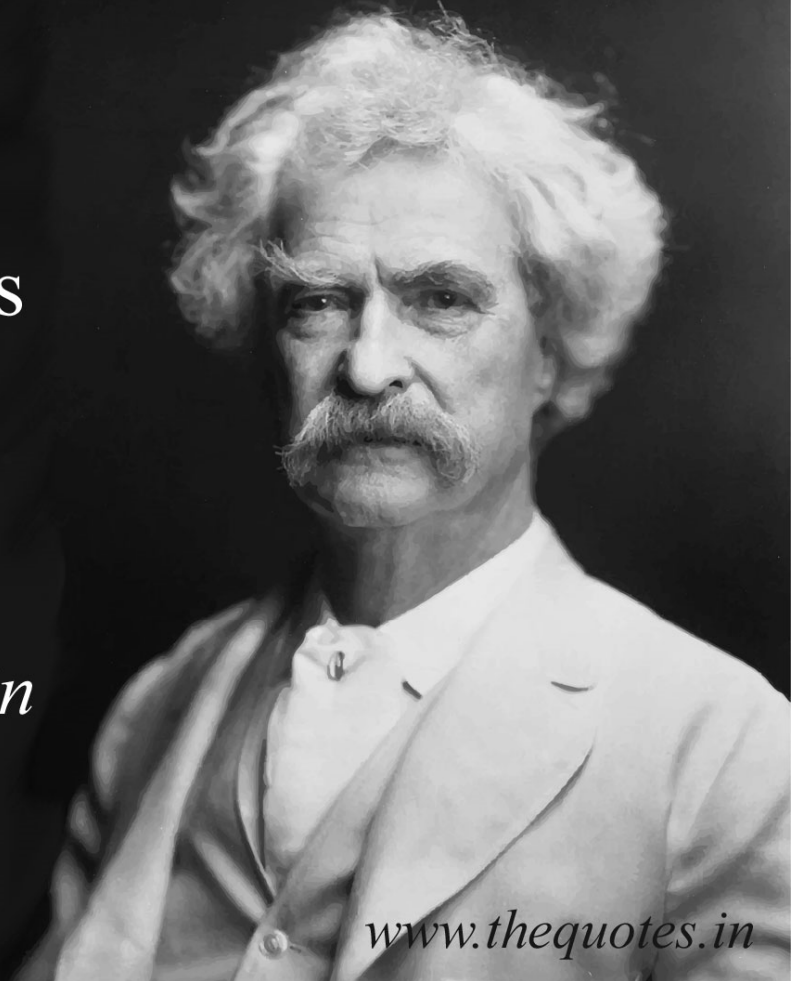
Professor Cliff Mass, Atmospheric Sciences

University of Washington, 12/1/2017



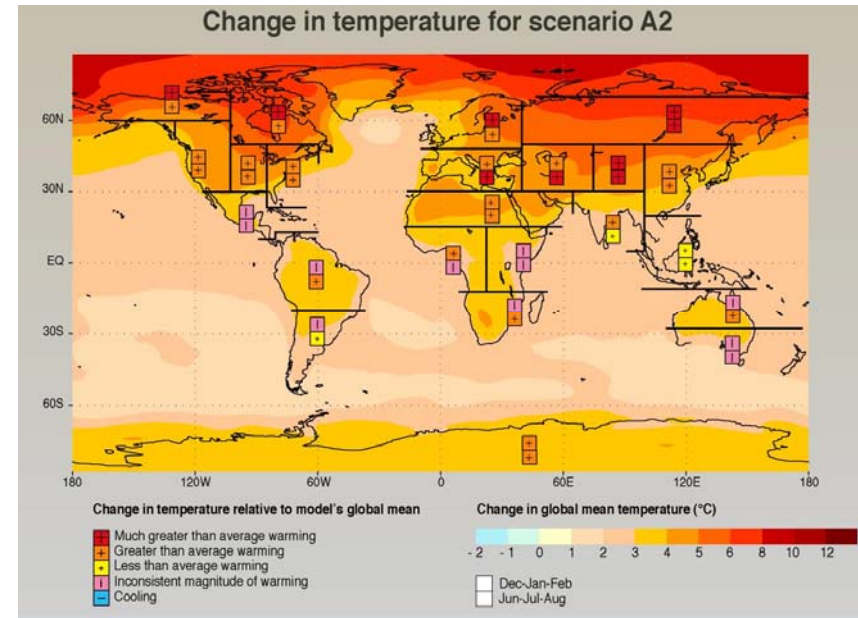
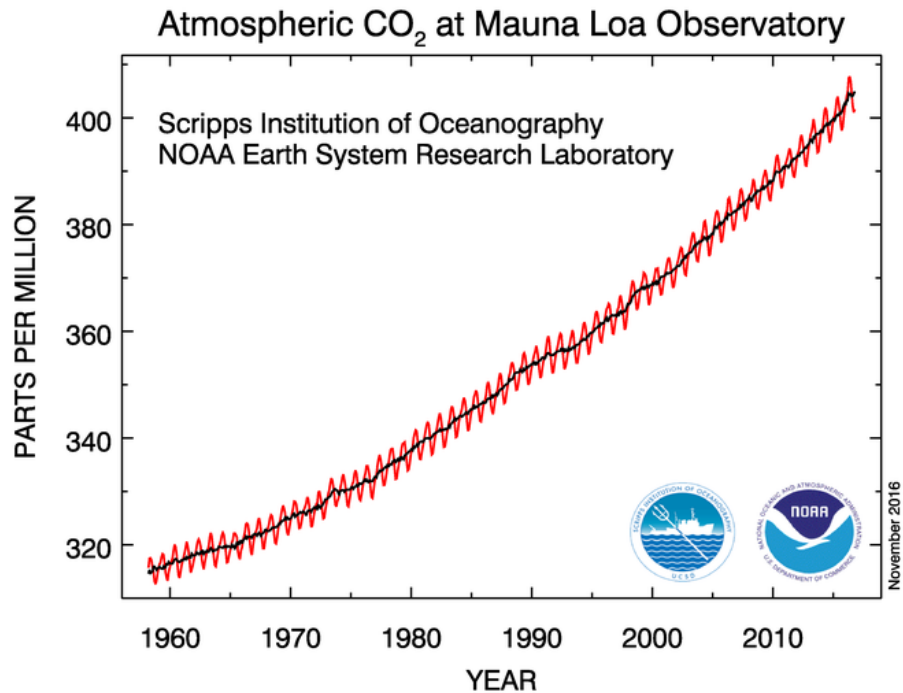
It ain't what you don't know
that gets you into trouble. It's
what you know for sure that
just ain't so.

Mark Twain



www.thequotes.in

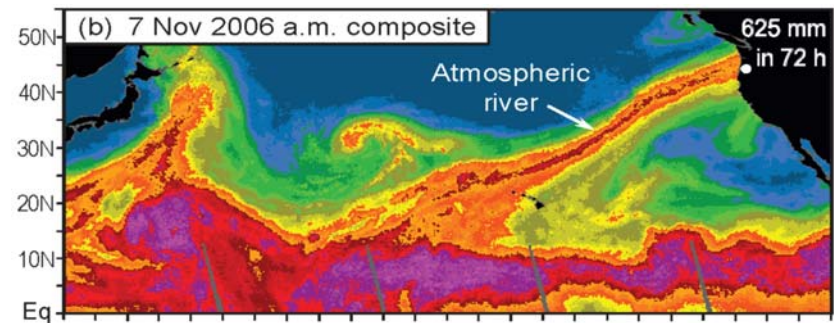
Anthropogenic Emissions of Greenhouse Gases Will Have Large Impacts on the Earth's Climate During this Century



These impacts will include enhancement of some extreme weather events

For example:

- Stronger atmospheric rivers striking the West Coast
- Greater flooding on NW rivers
- The strongest hurricanes will get stronger



Unfortunately, there are serious problems in communicating the current and future implications of climate change on extreme weather.

- Hype and exaggeration of **current** and future impacts by many in the media, non-governmental organizations, some politicians, and even a few activist scientists.
- Dismissal of potential impacts of greenhouse gases by some some conservative media and advocacy groups.
- **Inaccurate information is being communicated to the public by BOTH the left and the right.**

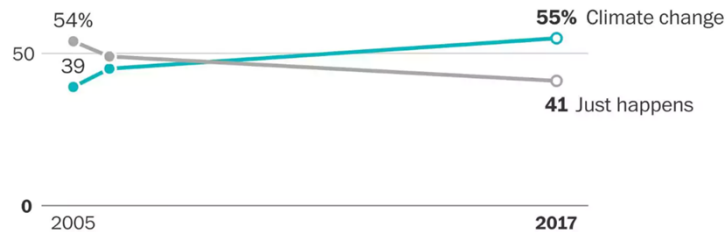


A misinformed public now has many mistaken beliefs about the current impacts of greenhouse gas increases on extreme weather

Energy and Environment

Majority of Americans now say climate change makes hurricanes more intense

Q: Do you think the severity of recent hurricanes is most likely the result of global climate change, or is it just the kind of severe weather events that happen from time to time?



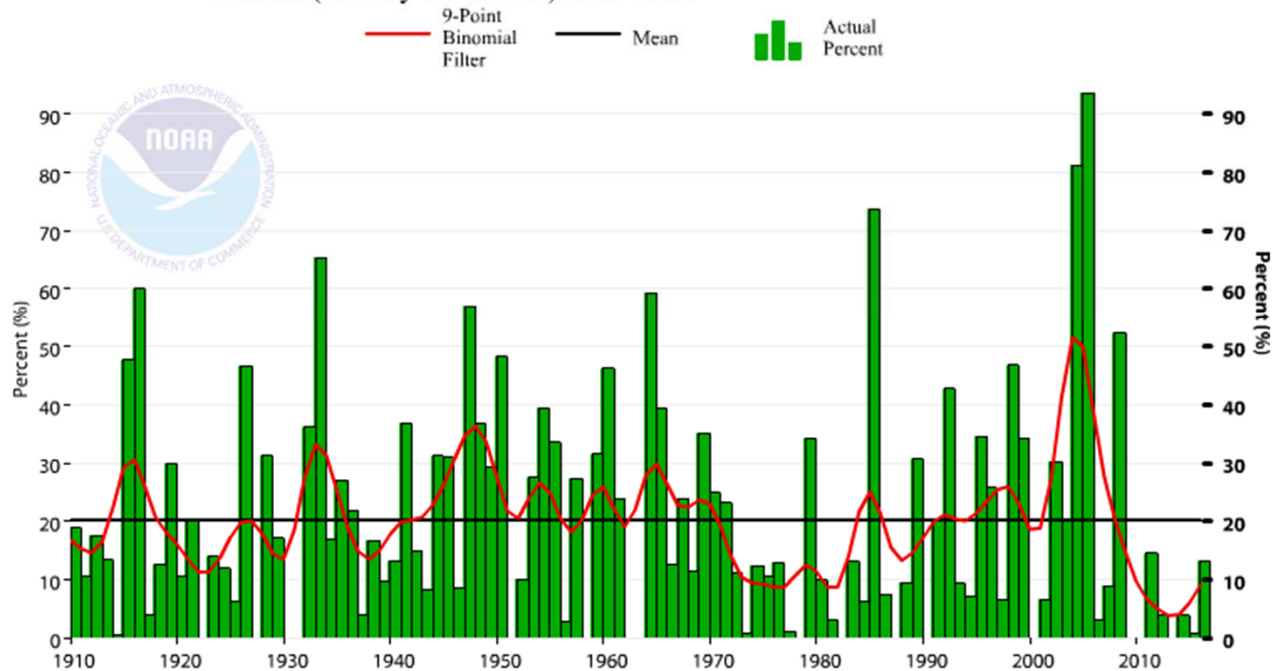
Was Hurricane Sandy Caused by Global Warming?

- A. **63.72%** Yes
- B. **36.28%** No

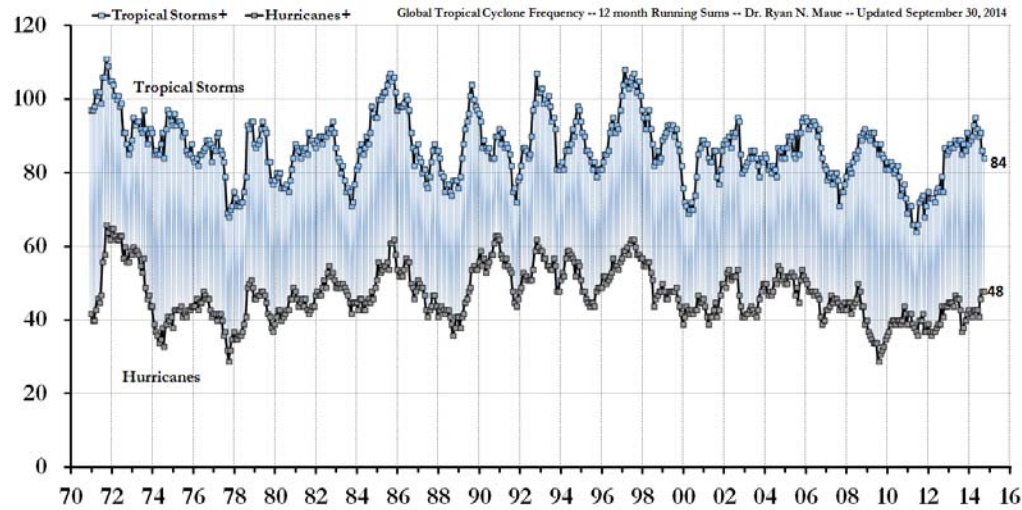


Actual Hurricane Trends: No Increase in Land-falling Hurricanes

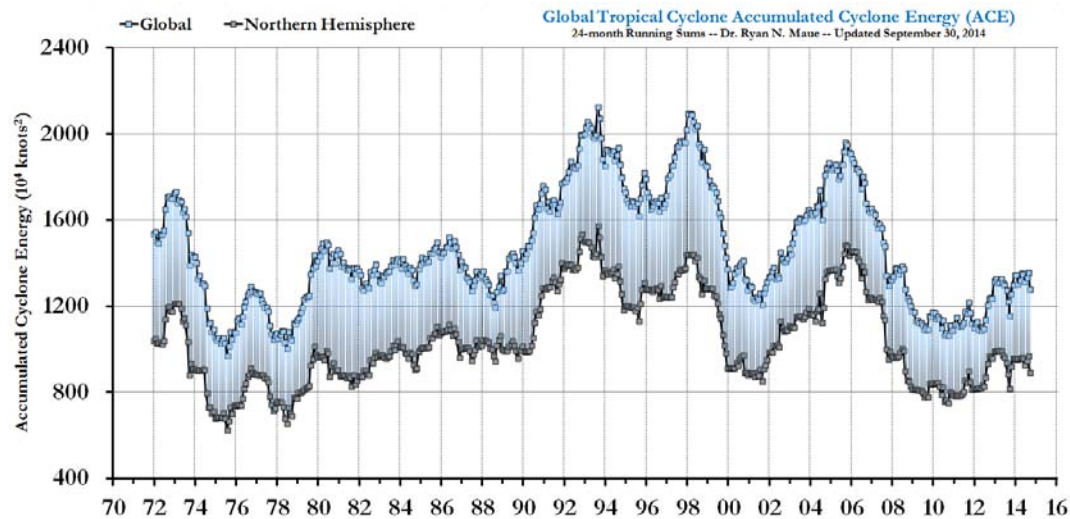
Contiguous U.S. Extremes in Landfalling Tropical Systems (Step 6**) Annual (January-December) 1910-2016



No upward trend in cyclone frequency or intensity



Global Tropical Cyclone Frequency



Global Cyclone Energy

No evidence or modeling results suggest that Hurricane Sandy had anything to do with climate change

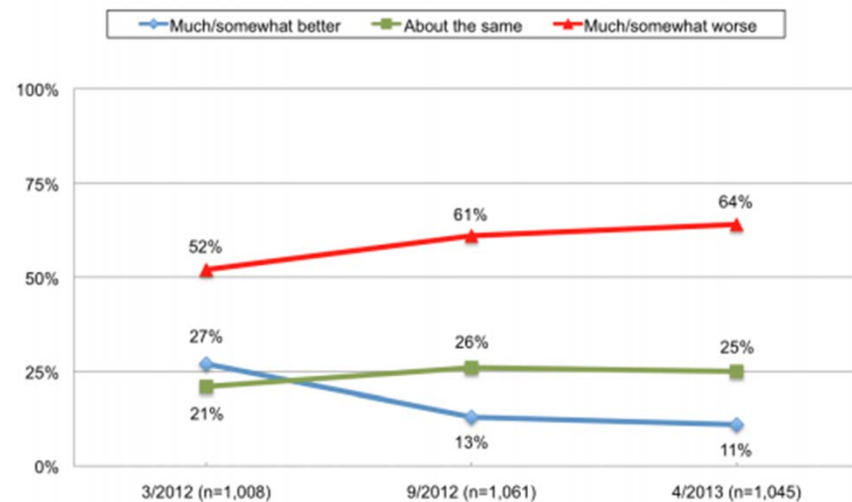
Climate change

Climate change likely to steer away Sandy-like superstorms, study says

Scientists predict stronger storms but say changing air patterns will prevent them from hitting US east coast

The Media Hype and Enhanced Communications Have Convinced Folks That Extreme Weather Has Generally Increased

Growing Majority of Americans Say Weather in the United States Has Been “Worse” Over the Past Several Years



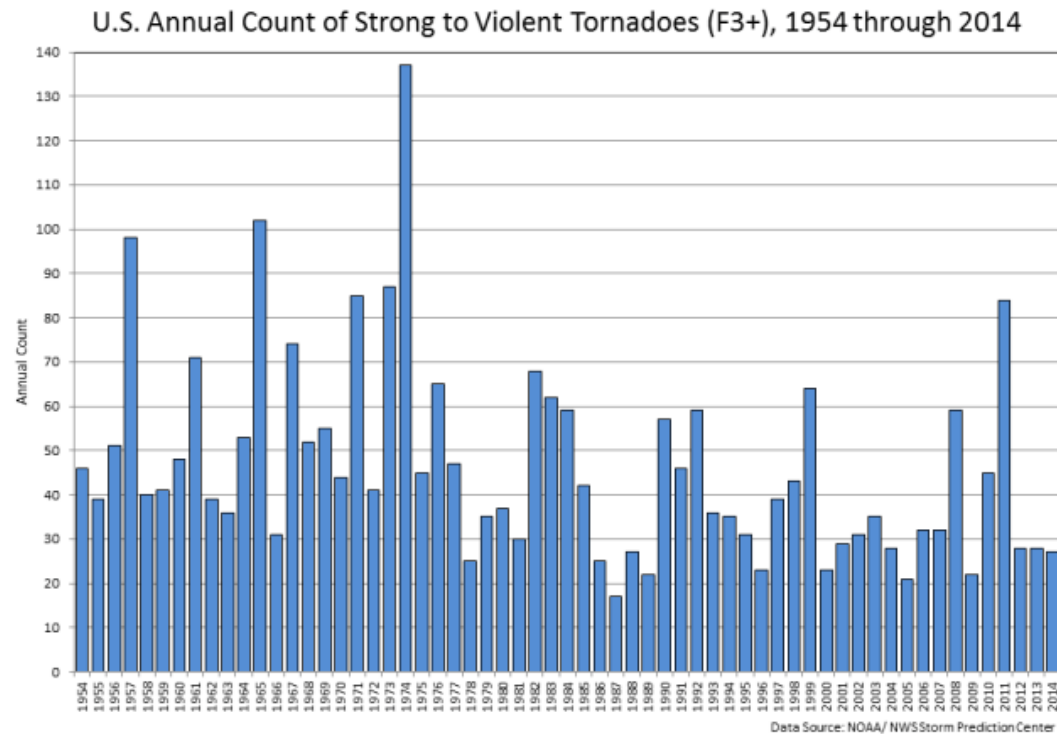
In your opinion, over the past several years, has the weather in the U.S. been...

Base: Americans 18+.

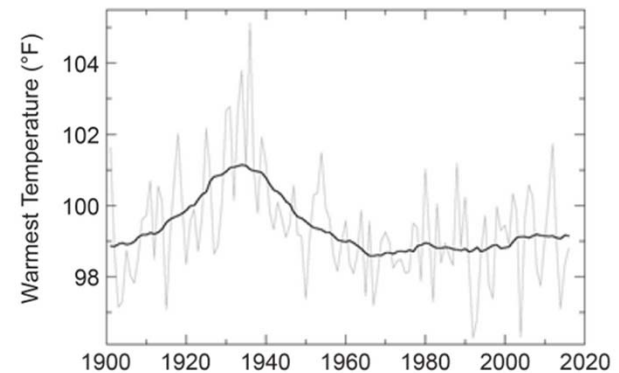
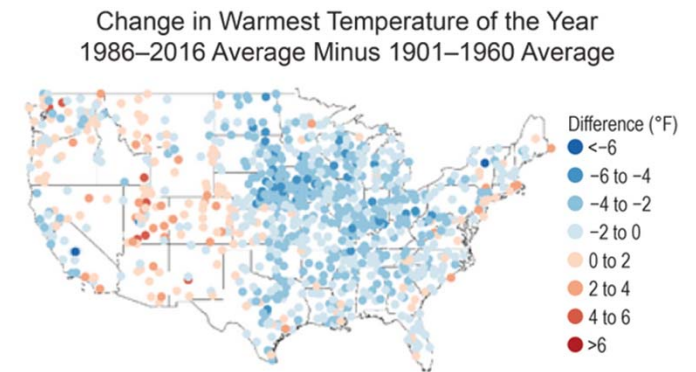
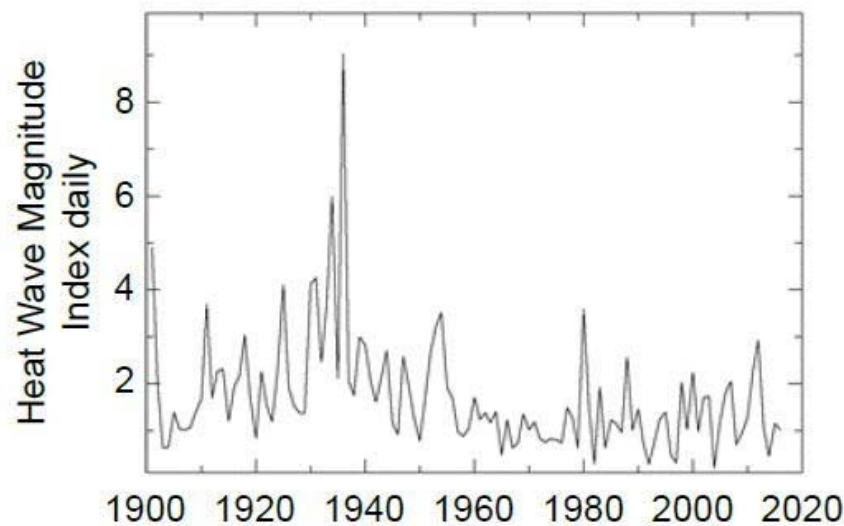


George Mason University
Center for Climate Change Communication

Reality: no increase in hurricanes, no increase in strong tornadoes, and more



Heat Waves: Less of a Trend Than Suggested by Some



Observed changes in the warmest daily temperatures (°F) of the year in the contiguous United States. Maps (top) depict changes at stations; changes are the difference between the average for present-day (1986–2016) and the average for the first half of the last century (1901–1960). Time series (bottom) depict the area-weighted average for the contiguous United States.

And there is plenty of misinformation on the other side....





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Explore Issues



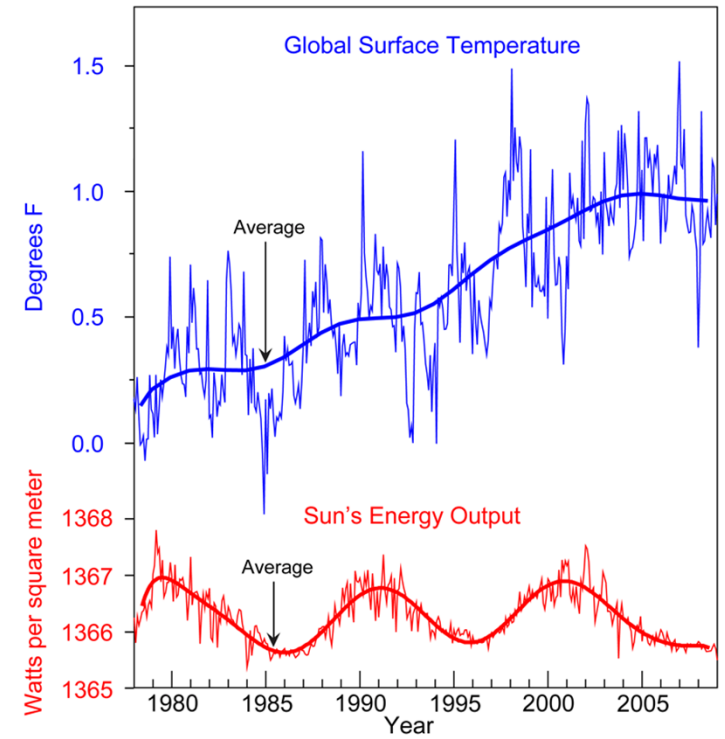
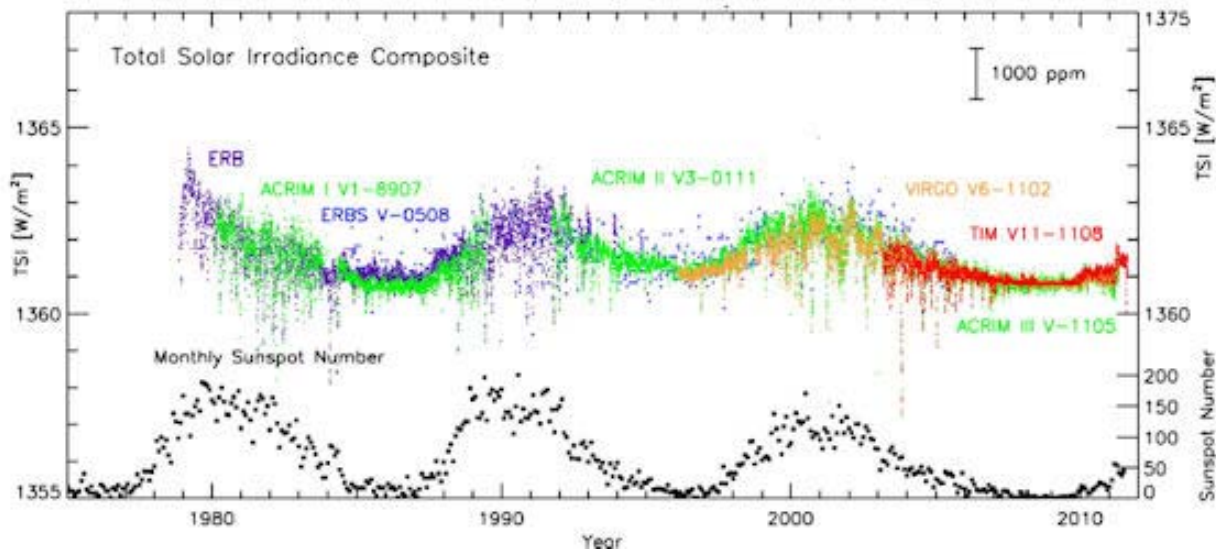
REPORT Environment



Warming Up to the Truth: The Real Story About Climate Change

- “The sun has driven a major portion of the 20th century temperature change.
- The surface warming that should be occurring from human-made actions, which is predicted to be accompanied by low troposphere warming, cannot be found in modern records from balloon and satellite platforms.
- The recent surface warming trend may owe largely to changes in the sun's energy output.”

The Truth: Solar Variability is Too Small to Explain Anything



Policy Implications of Climate Models on the Verge of Failure

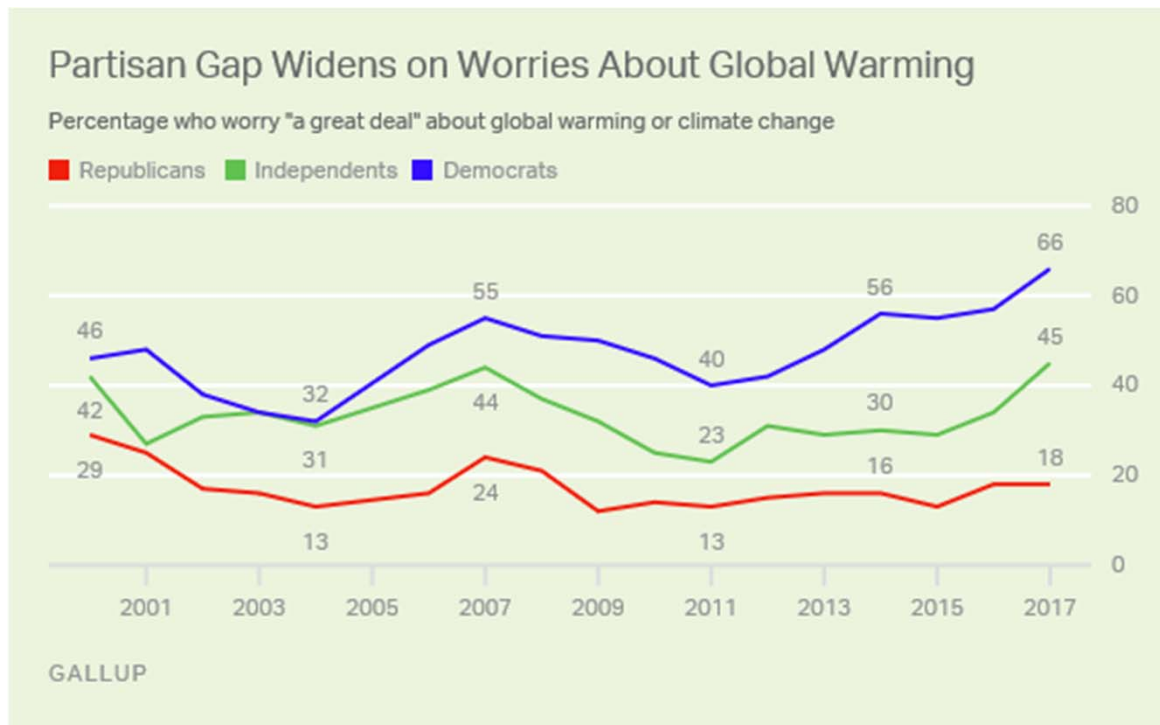


Paul C. Knappenberger and Patrick J. Michaels

Center for the Study of Science, Cato Institute, Washington DC

“Here, we find that at the global scale, climate models are on the verge of failing to adequately capture observed changes in the average temperature over the past 10 to 30 years”

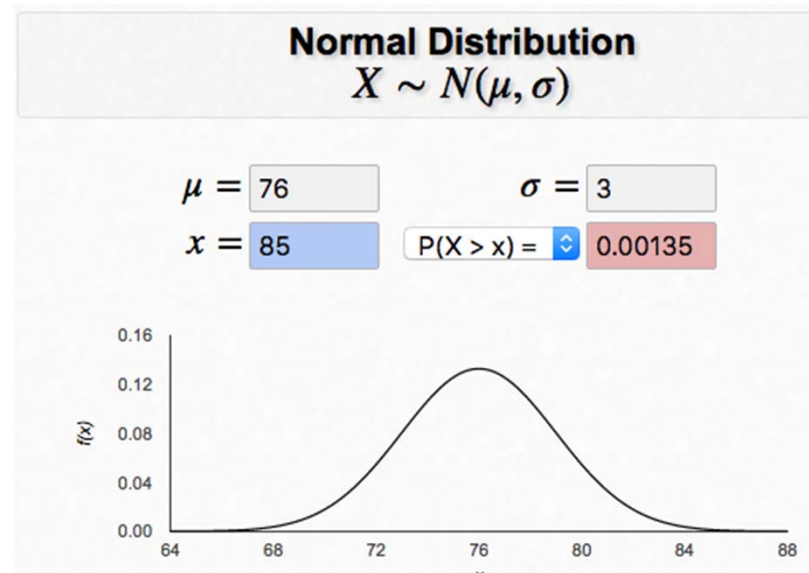
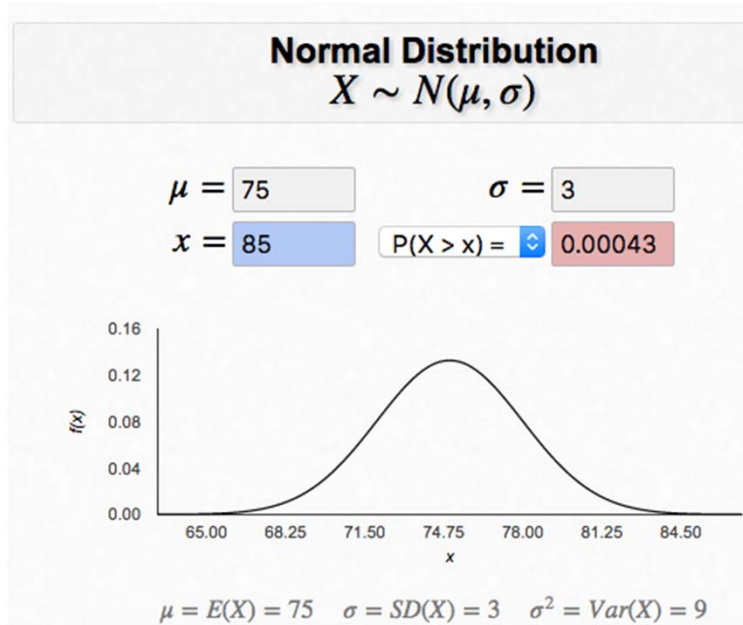
With the left-oriented media hyping current impacts and the right-oriented medium playing them down, the partisan divide is growing



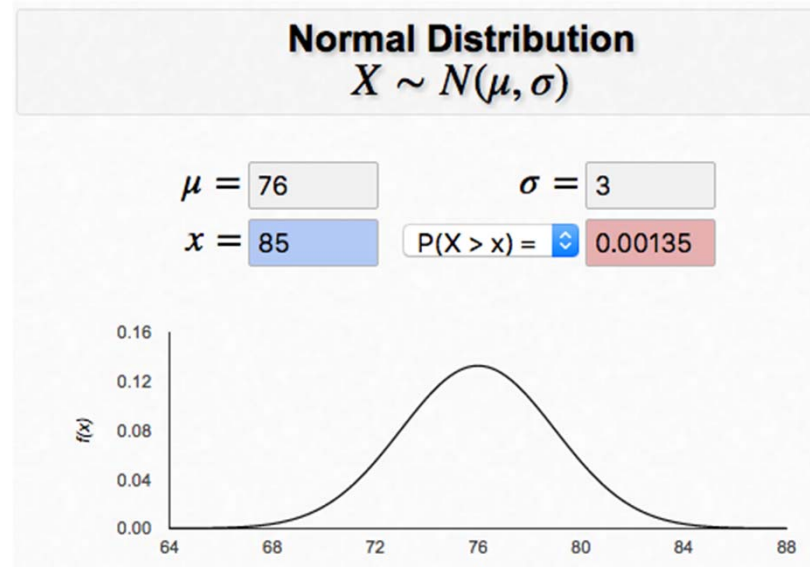
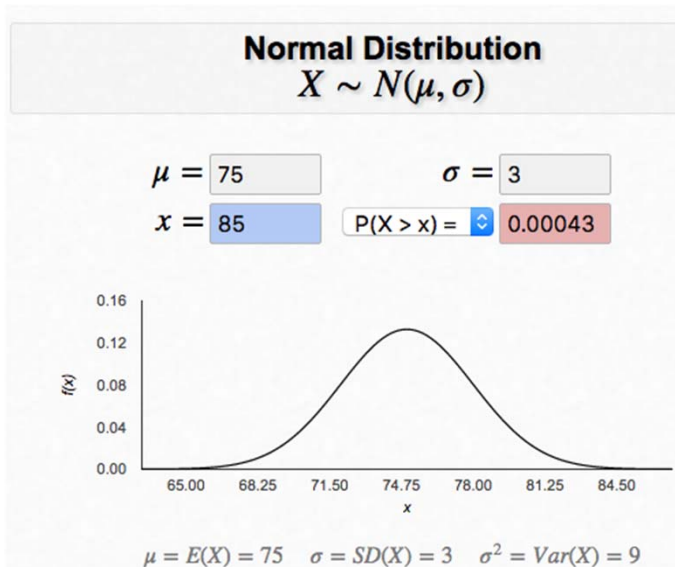
Statistical Misrepresentation by GW Activists

- Often GW activists will talk about temperature (or some other parameter) exceeding a threshold and how that will change with GW.
- They describe that threshold being exceeded X times more often. (X is usually a large number)
- Sounds very scary.
- But because of the nature of the tails of distributions, the change in actual impacts **may be very small**.

- Consider a mean temperature of 75F and an increase by 1F. Gaussian distribution.
- The probability of exceeding 85F increases by 3.14 times! Yikes!



- But consider the real increase in threat
- Increase probability of exceeding 85F by .1%.
One tenth of one percent. Not so scary.



There is a lot of these statistical games going on



National Climate Assessment

This trend has continued in 2011 and 2012, with the number of intense heat waves being almost triple the long-term average.

THE CONVERSATION

We estimate that there is at least a 175 times increase in likelihood of hot March months because of the human influence on the climate.

Some Recent Examples of Exaggerated Claims for Climate-Related Extremes



Northern California Wildfires



Gov. Brown: Climate Change Contributes To Catastrophic California Wildfires



“That’s the way it is with a warming climate, dry weather and reducing moisture,” Brown warned. “These kinds of catastrophes have happened, they’ll continue to happen, and we have to be prepared to do everything we can to mitigate.”

The media and advocacy groups claim a direct connection between the fires and global warming



Opinion / Editori

Editorial The climate-change fire alarm from Northern California



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GLOBAL WARMING IS MAKING WILDFIRES AND HURRICANES WORSE, AL GORE SAYS

BY JAMIECA DELIZO ON 10/14/17 AT 5:26 PM

MIT
Technology
Review

Topics+ The Download Mag



A fire consumes a barn in Glen Ellen, California, on October 9.

JUSTIN SULLIVAN/GETTY

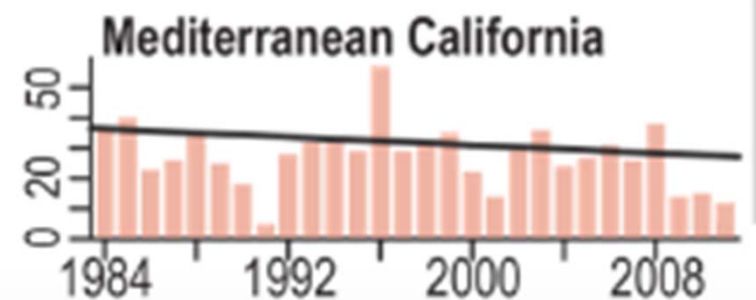
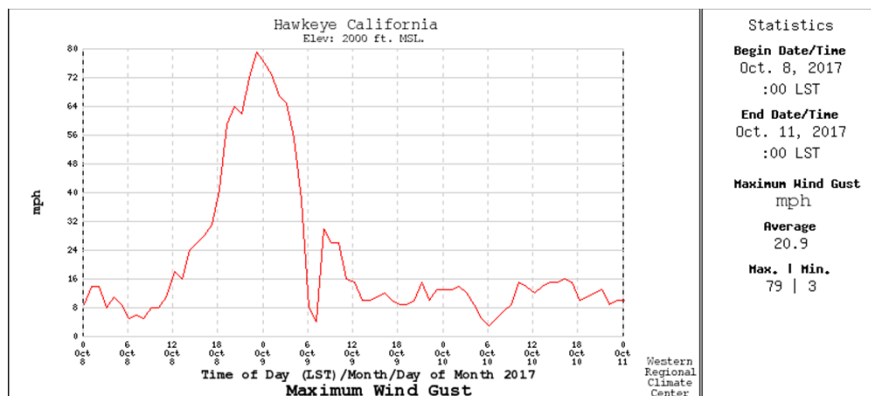
Sustainable Energy

Did Climate Change Fuel California's Devastating Fires? Probably.

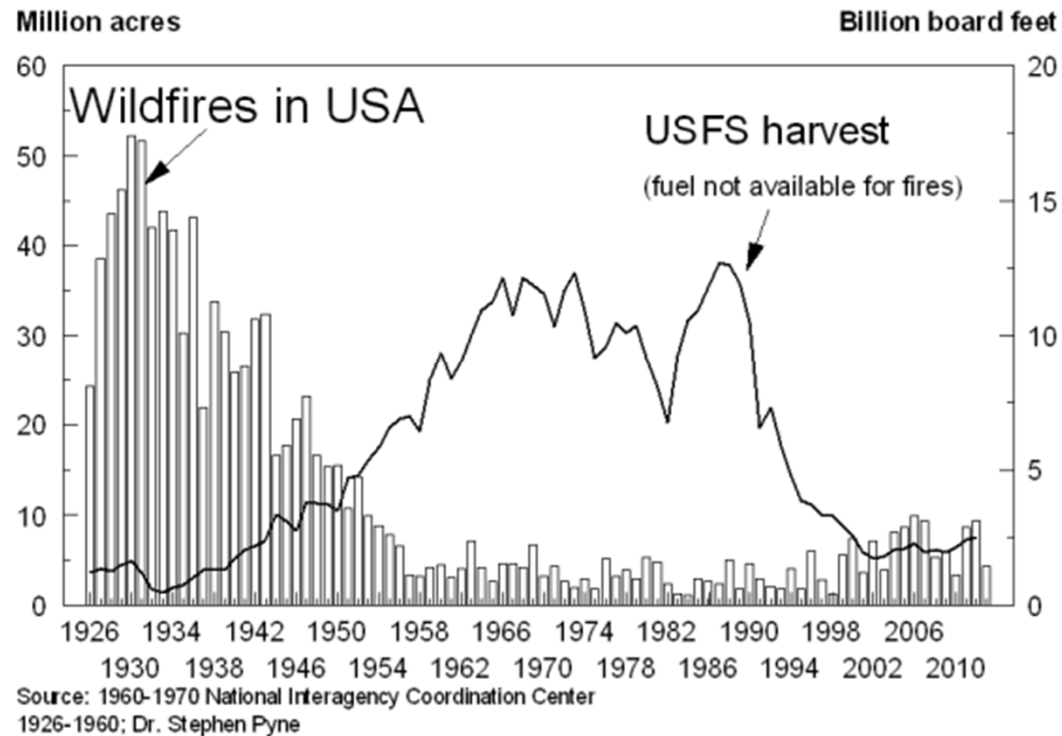
A long drought and a record hot summer set the conditions for a brutal wildfire season.

Global Warming Had Little to Do With The Oct 8/9 Fires

- Deep literature showing a lack of connection between prior warm/dry conditions and fires over the CA coastal area.
- Fires occurred after the long warm/dry CA summer. Fuels (grasses) would be dry no matter what.
- Very strong winds initiated and stoked the fire. No evidence such winds are encouraged by GW. Probably the opposite.
- A very wet winter enhanced grasses. Not expected under GW.



More fires in the early 20th century followed by suppression



Increasing Risk of Major Wildfires in the West

- Climate change is a small part of this.
- Suppression has produce unhealthy forests with lots of fuels ready to burn.



Now



Original

Increasing Wildfire Risks

- Huge increases of population in the urban/fire interface
- Large increase of recreation use of forests.



Hurricane Harvey: Heavy Precipitation Causing Massive Flooding in Houston. The media and others point to global warming



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Hurricane Harvey: The link to climate change

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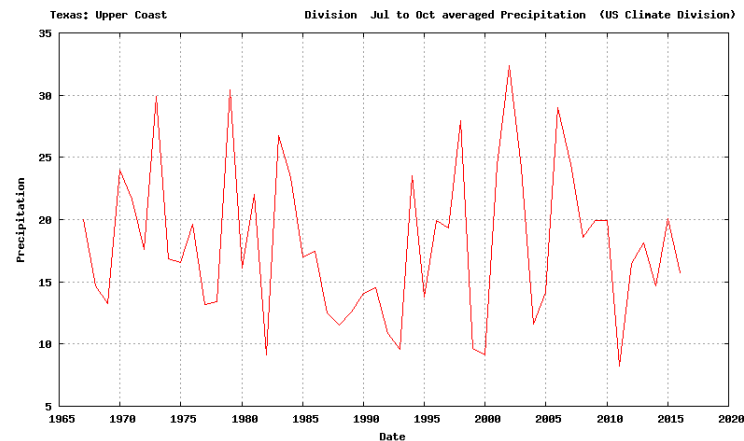


Opinion / Editorial

Editorial Harvey should be a warning to Trump that climate change is a global threat

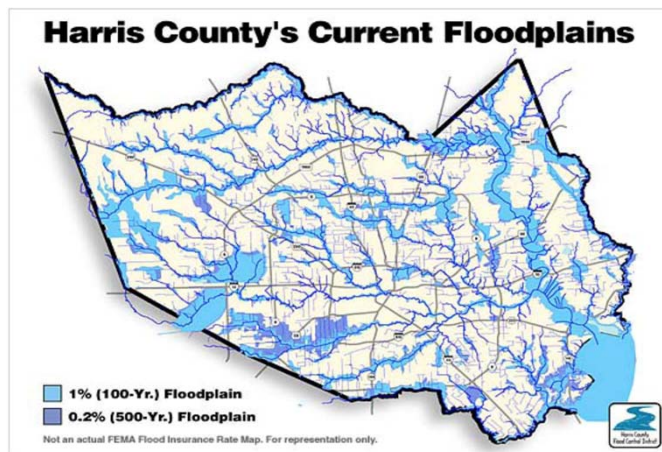
But Global Warming Could NOT Have Been the Real Cause of this Disaster

- The key reason Houston got so much precipitation was because Harvey stalled for days. No connection with GW.
- Gulf temperatures were only about .5C about normal, which only would enhance precipitation by around 3%
- There is no long-term upward trend in precipitation Houston



The Real Issue: Mismanagement of Houston's Development

- Irresponsible development of previous swamps
- Inadequate planning for drainage
- Multiple floods during the past years as development proceeded.



Did overdevelopment make flooding in Houston worse?

As residents recover from Harvey, some experts wonder if the disastrous flooding could have been mitigated.

An Industry for Exaggerating or Miscommunicating Climate Change Has Developed on Both Sides



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The Danger of Exaggerated Claims: Reality Can Undermine Scientific Credibility

Example: The Disappearing Snowpack

- A number of politicians, some climate groups, and even some local scientists talked about a 50 percent decline of Cascade snowpack from 1950-1995, with global warming identified as the probable cause.
- Local politicians, like Mayor Nickels, wrote op-ed pieces about the threat, predicting a rapid decline in Cascade snowpack (2007).
- Reality: NW snowpack has not declined during the past several decades.

The Seattle Times
Winner of Ten Pulitzer
Prizes

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Saturday, February 14, 2004 - Page updated at 12:00 AM

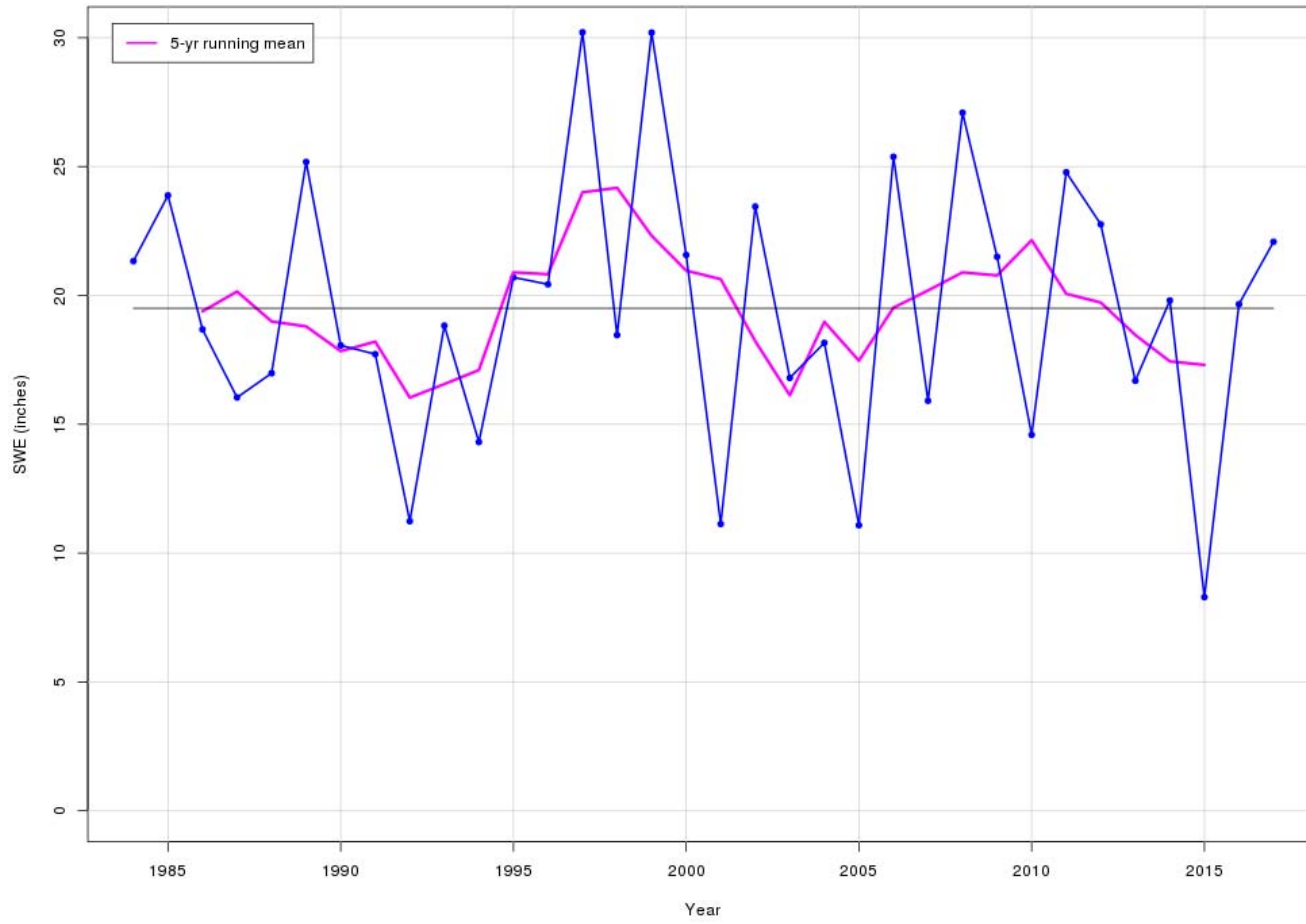
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Global warming hitting Northwest hard, researchers warn

By **Craig Welch**
Seattle Times staff reporter

To find the most compelling evidence to date that global warming could shrink damp Cascade snows by half in coming decades, Seattle scientists first took a step back in time.

Pacific Northwest (WA,OR,ID,MT) Region (224 Sites) April 1 SWE, 1984 - 2017



Seattle's mayor suggested our snowpack had declined by 50%



Editorials & Opinion: Wednesday, February 07, 2007

[✉ E-mail article](#) [🖨 Print view](#)

Guest columnist

State should find ways to protect City Light's climate-protection efforts

By Greg Nickels

Special to The Times

While the other Washington — Washington, D.C. — finally is waking up to the threat of global climate change, **Seattle** continues to be a leader in the effort to reduce greenhouse gases right here at home.

In this **city**, people get how rising temperatures threaten our communities, our economy and our way of life: It's the snow.

The average snowpack in the Cascades has declined 50 percent since 1950 and will be cut in half again in 30 years if we don't start addressing the problems of climate change now. That snow not only provides our drinking water, it powers the hydroelectric dams that keep our lights on.

So, we can take great pride in the fact that **Seattle City Light** was the first major utility in the nation to produce zero net greenhouse-gas emissions. Think about it: We are showing the world how to power a **city** without toasting the planet! That is a powerful statement.

And the poor predictions get noticed



POLICY NOTE

Key Findings

1. Some academics, like University of Washington Professor Paul Johnson, say that declining snowpack levels in the Northwest is a sign of global warming.
2. State Director of Ecology Maia Bellon says less snow and warm, dry winters "could be the new normal."
3. They're wrong. Snowpack levels have been above average in eight of the last ten years.
4. In the winter of 2015-16 snowpack was 112% of normal. In 2016-17 it was 115% of normal.
5. Politicians and activists have a strong incentive to tell alarmist stories even when they are not true.
6. However, imposing dramatic and costly public policies based on poor science shows the harm of believing false predictions about climate

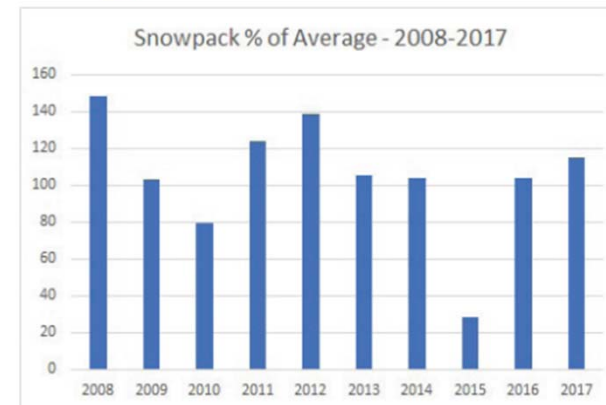
No sign of warming: Snowpack levels in Washington state are average again

By Todd Myers, Director, Center for the Environment

April 2017

It is one of the most common claims about the impact of climate change in the Pacific Northwest – the threat that our snowpack will decline, harming recreation, water supply, farmers, and fish. Recently, University of Washington professor Paul Johnson pointed to the claim that "our mountain snowpack is reduced by an increasingly earlier spring and later fall."¹

Actual snowpack data, however, contradict this oft-repeated claim, as shown in the graph below.



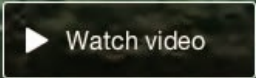
Snowpack levels in Washington state have been above average in eight of the last ten years

The Media is Failing

- Stories are either superficial or poorly disguised advocacy pieces in the liberal “mainstream” media.
- Little analysis of the information provided by governments or NGOs.
- Media science reporting is profoundly hollowed out, with reporters doing quick, shallow stories.
- Most reporters lack the technical knowledge to analyze complex science issues.
- Conservative media (e.g., National Review, WSJ) promote the opposite, non-science based viewpoints.

SEA CHANGE

The Pacific's Perilous Turn



Ocean acidification, the lesser-known twin of climate change, threatens to scramble marine life on a scale almost too big to fathom.

Story by
CRAIG WELCH

NORMANBY ISLAND, Papua New Guinea — Katharina Fabricius plunged from a dive boat into the Pacific Ocean

Instead, changing sea chemistry already has [killed billions of oysters](#) along the Washington coast and at a hatchery that draws water from Hood Canal. It's helping [destroy mussels](#) on some Northwest shores. It is a suspect in the softening of clam shells and in the death of [baby scallops](#). It is dissolving a tiny plankton species eaten by many ocean creatures, from auklets and puffins to fish and whales — and that had not been expected for another 25 years.

And this is just the beginning.



When one starts telling the straight story...the media, activists, and their friends go after you

theStranger

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SLOG

ENVIRO

Why Cliff Mass Is a Very Dangerous Weatherperson

by [Charles Mudede](#) • May 6, 2016 at 1:37 pm

theStranger

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SCIENCE

Cliff Mass Blames Liberals for the Lack of Progress on Climate Change

by [Sarah Myhre](#) • Oct 6, 2017 at 11:16 am

Cliff Mass Knows Climate Change Is Real, So Why Are Activists and Scientists So Mad at Him?

Washington State's most popular meteorologist thinks you deserve the truth about climate change. And that's the problem.

By Daniel Person Tue., Oct 6 2015 at 09:41PM




Global Warming and Weather Extremes: What is the best guidance we can provide?

Hurricanes:

- Little impacts to date from GW.
- By the end of the century there will be fewer hurricanes, but the strongest ones will get stronger

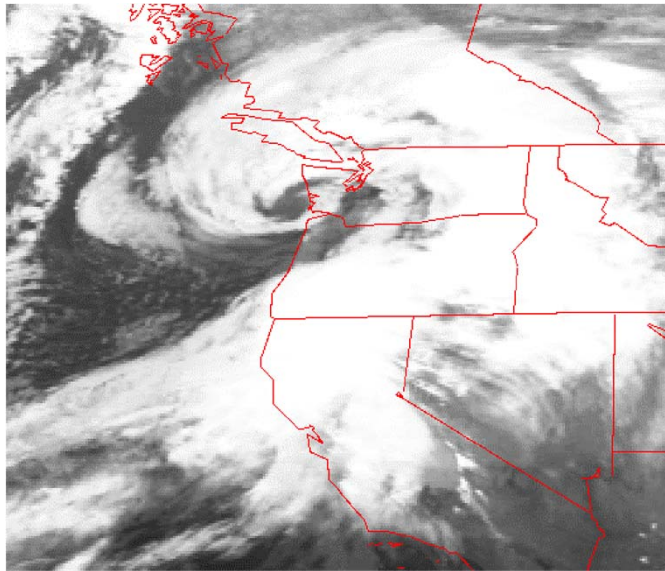
“It is premature to conclude that human activities—and particularly greenhouse gas emissions that cause global warming—have already had a detectable impact on Atlantic hurricane or global tropical cyclone activity.”



The image shows a screenshot of the GFDL (Geophysical Fluid Dynamics Laboratory) website. The header features the GFDL logo and the text 'Geophysical Fluid Dynamics Laboratory'. Below the header is a navigation menu with five items: RESEARCH, MODELS, MODEL DATA, GFDL FOR YOU, and PUBLICATIONS. The main content area displays the title 'Global Warming and Hurricanes' in a large, bold font, followed by the subtitle 'An Overview of Current Research Results'. At the bottom of the page, it states 'Last Revised: Oct. 26, 2017'.

Northwest Windstorms

- Will there be more of them?
- Will they become more intense?



The Inauguration Day Storm
1993

Scientists say as climate changes,
odds increase for deadly storms



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by KING 5 News

Posted on November 12, 2013 at 6:03 PM
Updated Tuesday, Nov 12 at 6:20 PM

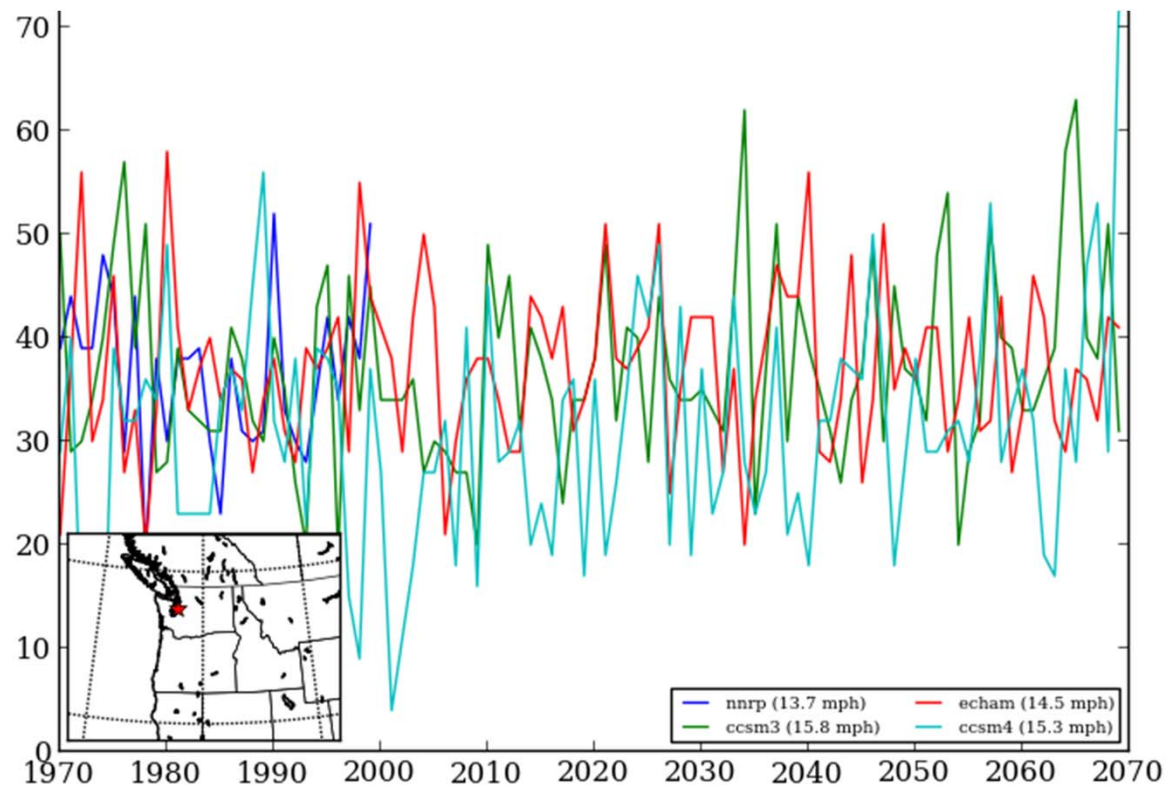
SEATTLE - Members of an international conservation group say it's time to prepare for more intense, more frequent and more damaging storms in the Pacific Northwest.

Northwest Windstorms

- **The answer appears to be no.** No increasing trend.
- UW investigated this issue for Seattle City Light



Number of times per year winds exceed a high-wind threshold (DJF) at Seattle for several simulations



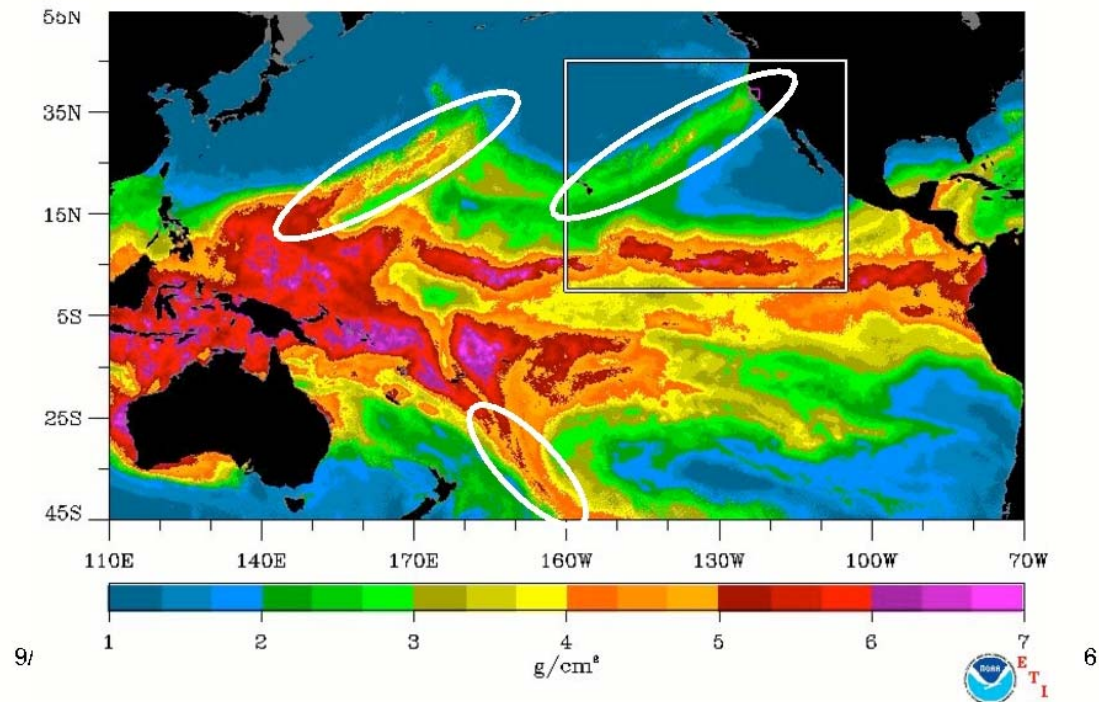
Northwest extreme precipitation and flooding: Will Increase Under Global Warming Later in the Century



Super Atmospheric Rivers

Atmospheric Rivers

A key to understanding West Coast extreme precipitation events

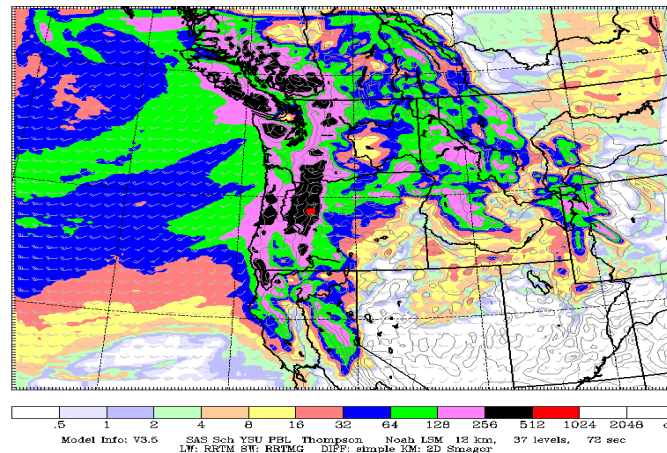


9/

6

Global warming will intensify atmospheric rivers

- Warmer air holds more water vapor.
- Examined a large collection of climate model simulations for changes from 1970-2000 to 2070-2100 based on “business as usual” greenhouse gas emissions.
- Winter-mean precipitation over the NW increases by 11-18% **while precipitation on extreme atmospheric river days increases by 15-39% .**

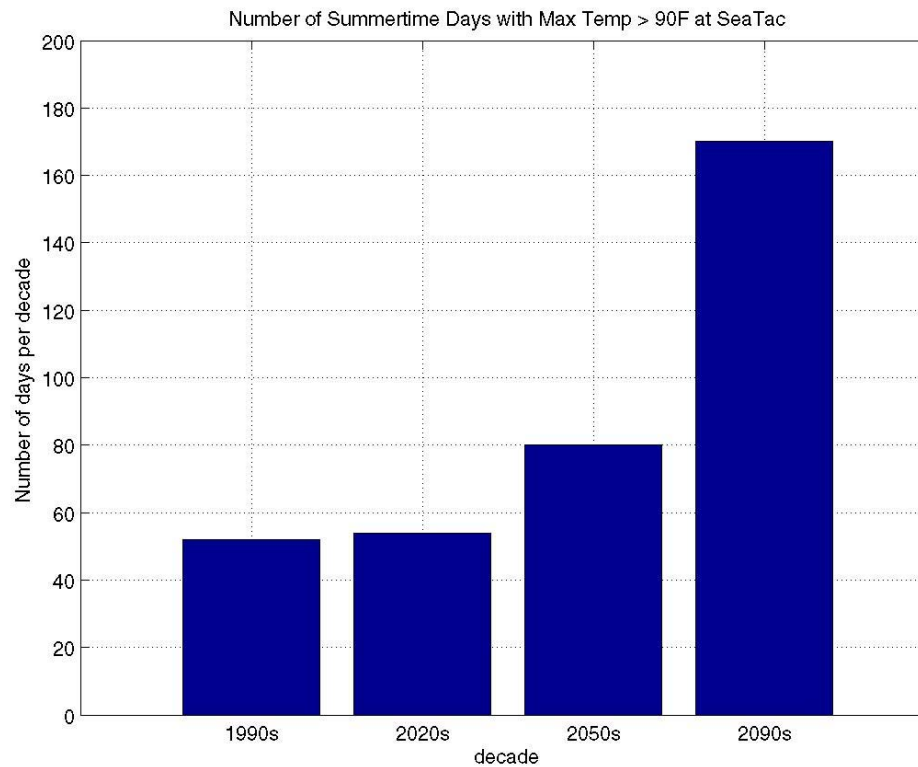


Flooding Potential Increases

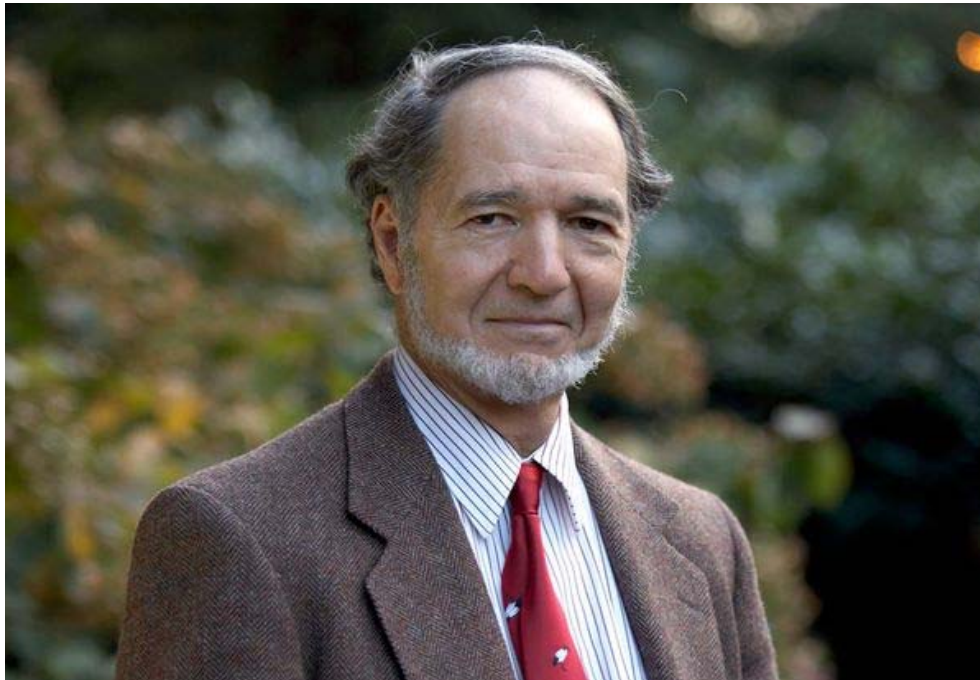
- Snow absorbs and helps to buffer heavy rain events.
- With less snow, there will be less “protection.”
- Thus, heavier rainfall could lead to greater flooding on major rivers.



A Key Issue for Communicating Climate Change Impacts: Most of the Significant Impacts in the Future



**Professor Jared Diamond, Author of
Collapse, Guns, Germs and Steel.**
No precedent of advanced action for a
future threat



A Large Majority of Americans Would Not Pay \$10. a Month to Deal with Global Warming

THE EXPERTS | ENERGY

How Much Will Americans Pay to Battle Climate Change? Not Much



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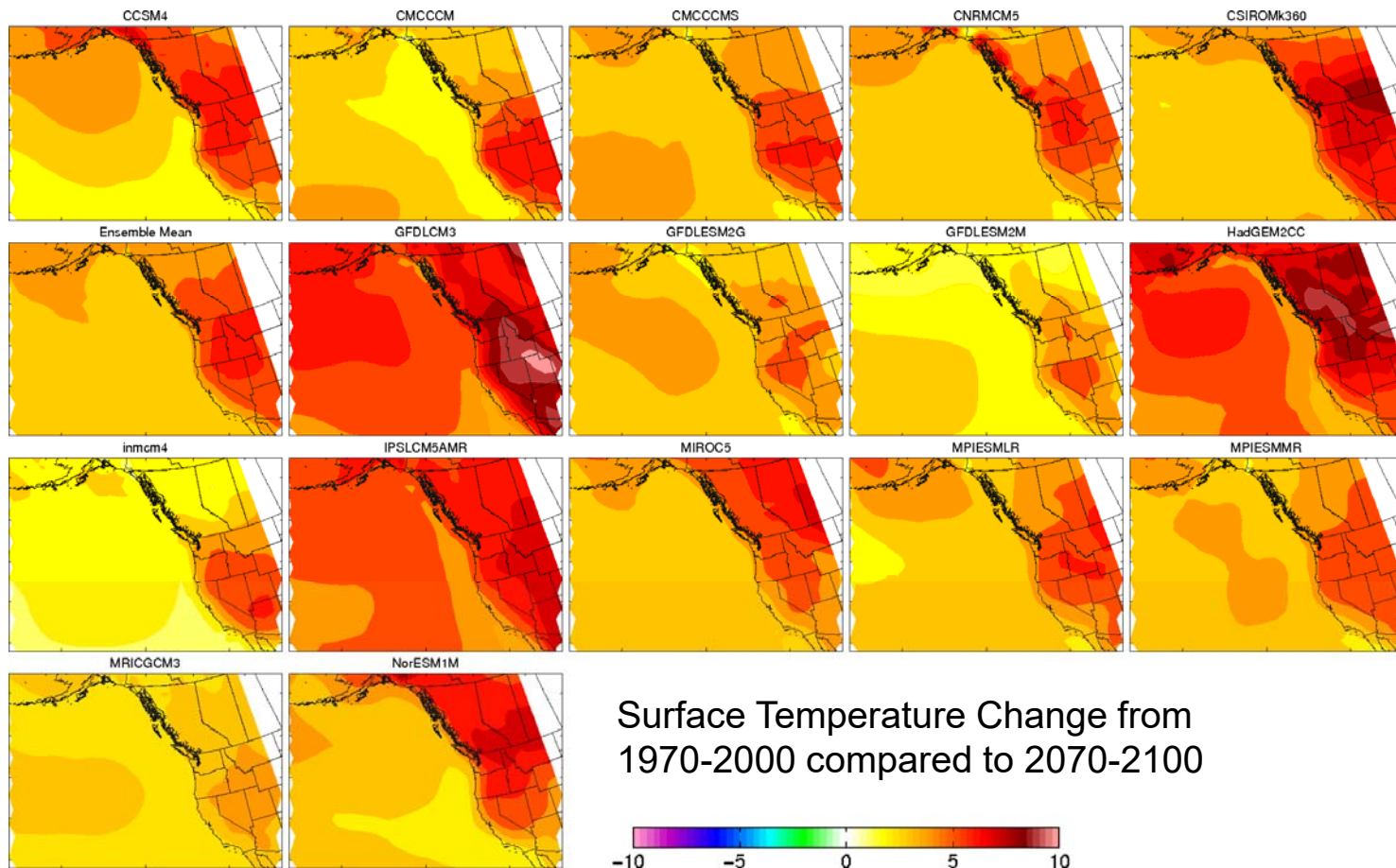
1. Behind United Airlines' Fateful Decision to Call

What do you think is the most important problem facing the country today?

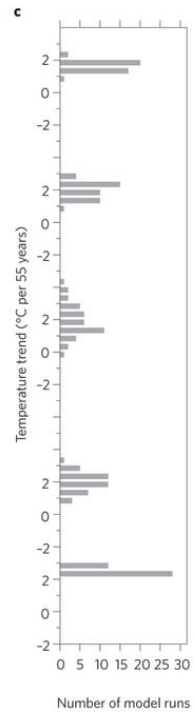
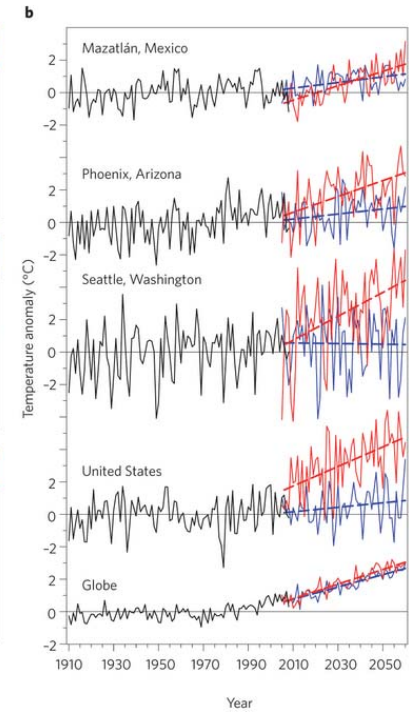
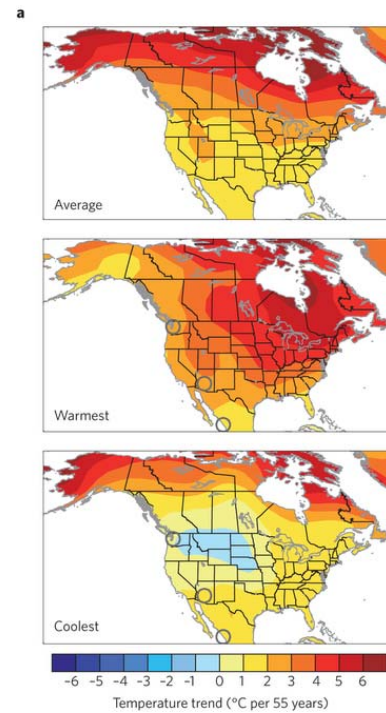
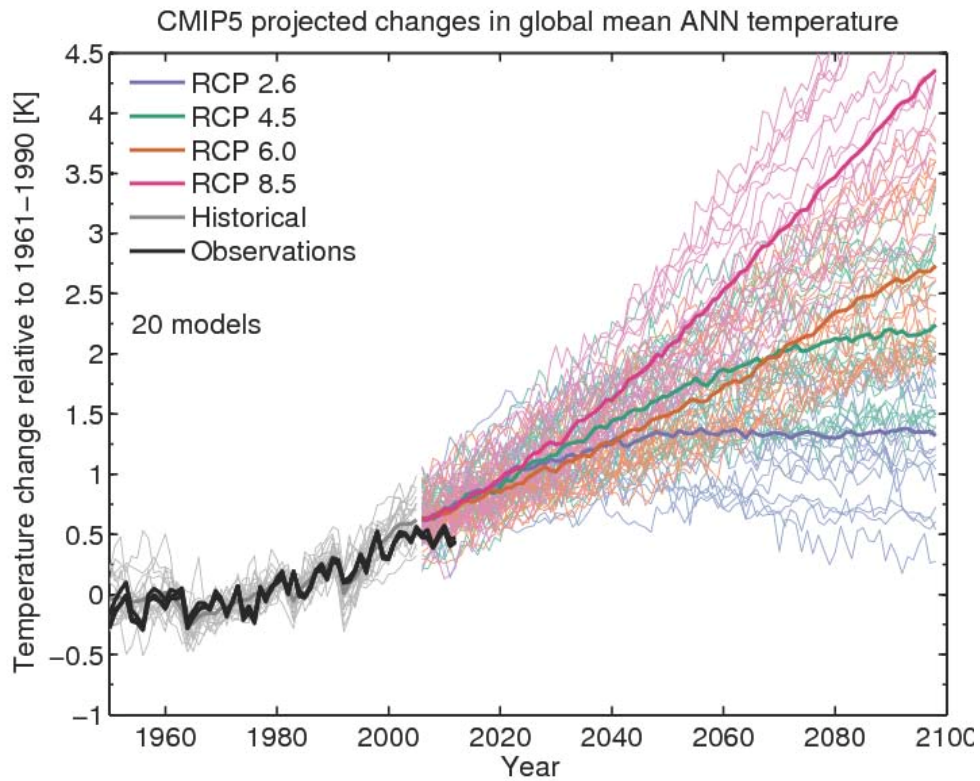
	Nov 2017	Oct 2017	Sep 2017	Aug 2017	Jul 2017	Jun 2017	May 2017
	%	%	%	%	%	%	%
ECONOMIC PROBLEMS (NET)	15	17	17	20	21	19	21
Economy in general	4	5	6	6	8	6	6
Unemployment/Jobs	4	5	4	7	6	6	6
Taxes	2	2	2	2	1	1	1
Federal budget deficit/Federal debt	2	3	2	2	2	1	4
Corporate corruption	1	1	1	1	1	1	*
Gap between rich and poor	1	2	2	1	1	1	2
Lack of money	1	1	*	1	*	1	1
Wage issues	*	*	*	1	2	*	1
High cost of living/Inflation	*	*	1	*	*	1	*
Fuel/Oil prices	--	--	1	--	--	--	--
Foreign trade/Trade deficit	--	--	*	*	*	*	--
NON-ECONOMIC PROBLEMS (NET)	85	84	82	81	79	81	78
Dissatisfaction with government/Poor leadership	23	20	18	20	19	25	18
Race relations/Racism	10	14	12	7	4	6	6
Healthcare	9	7	6	17	16	7	18
Unifying the country	7	11	8	6	7	6	4
Immigration/Illegal aliens	6	5	11	7	7	4	7
Guns/Gun control	5	4	*	*	1	*	*
Terrorism	5	2	1	3	4	8	2
Lack of respect for each other	4	4	2	3	2	3	2
Ethics/moral/religious/family decline	4	3	4	3	4	4	4
Crime/Violence	4	4	3	3	3	1	2
Situation with North Korea	3	5	6	4	4	*	1
Education	3	1	2	3	2	3	2
Poverty/Hunger/Homelessness	3	3	2	3	2	3	3
National security	3	2	2	3	3	2	5
Judicial system/Courts/Laws	2	1	2	1	1	2	2
Wars/War (nonspecific)/Fear of war	2	2	2	1	1	1	3
Environment/Pollution	2	2	3	2	3	6	2
The media	2	2	3	2	*	1	*
Drugs	2	1	1	1	1	1	1
International issues, problems	1	3	1	4	3	3	4
Care for the elderly/Medicare	1	*	*	1	*	*	*
Foreign policy/Foreign aid/Focus overseas	1	--	*	*	1	2	*



Uncertainty in Model Projections: How Do We Communicate This?



Substantial Variation Among Models



The Importance in Realistically Communicating the Impacts of Greenhouse Gas Increases on Extreme Weather

- Society needs to make adaptations to climate change to improve resilience
- Includes improving infrastructure, moving people/buildings, changing management of the environment (e.g., coasts and forests)
- Such adaptations must be based on the best possible information to be effective and not prohibitive in cost.
- Hying climate impacts may undermine dealing with the real problems.

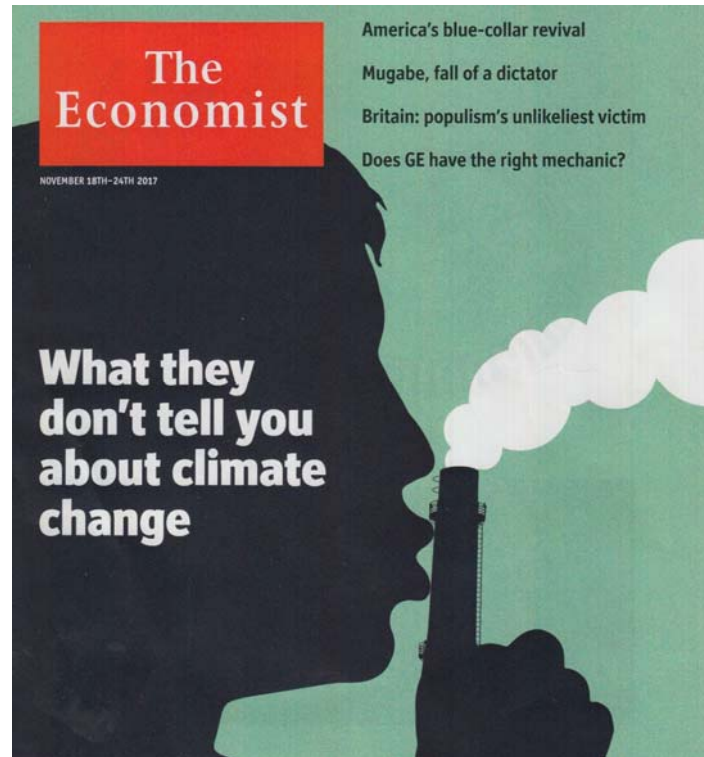


Real Problems we Need to Deal With

- Poor forest management and increased population in the urban/forest interface
- Too many living near rivers
- Too many living near slopes
- Cities built on flood plains, swamps, or without sufficient drainage.
- And many more...

Some principles for climate communication

- **Provide society with the most accurate information and projections as possible.**
- **Do not exaggerate or hype to get people “to do the right thing”**
- **Provide information about the uncertainty of climate projections**
- **Don't obfuscated by being incomplete or leaving off critical information. Tell the full story.**
- **Don't politicize the communication.**



The Paris agreement assumes that the world will find ways to suck CO₂ out of the air. In any realistic scenario, emissions cannot be cut fast enough to keep the total stock of greenhouse gases sufficiently small to limit the rise in temperature successfully. But there is barely any public discussion of how to bring about the extra “negative emissions” needed to reduce the stock of CO₂. Unless that changes, the promise of limiting the harm of climate change is almost certain to be broken.

The END