

# **Debunking Climate Denialists**

**Mark D. Fraser**

**Public Policy Officer, Albuquerque Section  
American Institute of Aeronautics and Astronautics (AIAA)  
Astronomy Instructor, Central New Mexico Community College (CNM)**

**New Mexicans for Science and Reason (NMSR) Meeting  
New Mexico Museum of Natural History and Science**

**9 December 2015**

**December 9th, 2015 NMSR Meeting - Mark Fraser on "Debunking Climate Denialists"**



7 PM Wednesday December 9th, New Mexico Museum of Natural History and Science, Multi-Purpose Room (to the left of the entry atrium), 1801 Mountain Road NW

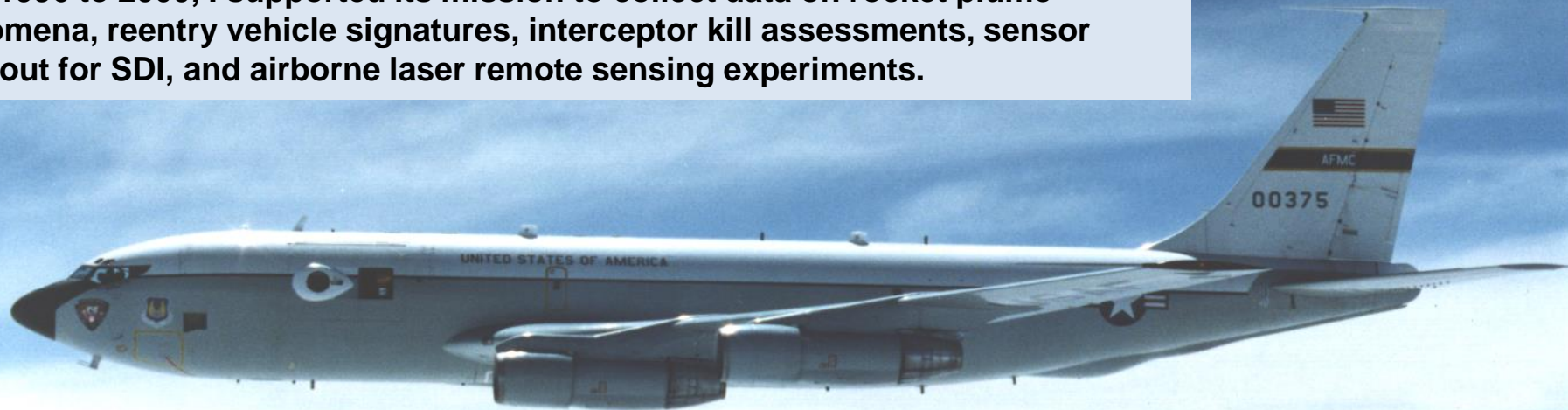
Mark Fraser teaches Astronomy at CNM with a sub-theme on global warming. He has a Master's Degree in Physics from the University of Missouri – Rolla, with graduate coursework in atmospheric science. He is Public Policy Officer for the AIAA-ABQ, in which he meets with congressmen and senators concerning science education. As a defense scientist for 30 years, he did research in ballistic missile defense, infrared signatures, atmospheric radiance/transmission, and endo/exo-atmospheric nuclear burst phenomenology. For several years he flew as a crew member on the USAF Argus C-135E airborne remote sensing program on domestic and overseas missions.

In this talk Mark will cover basic misconceptions, fallacies of logic, and common tactics used by climate denialists, politicians vs facts, satirical references, and research on the psychology of climate denialism. He uses scientific misunderstandings made by public figures as teaching moments for his students. His climate change article he wrote for the AIAA-ABQ is available online (below).

“Climate Change is a Mission Reality, Not a Political Debate”, by Mark Fraser  
<https://info.aiaa.org/Regions/SC/Albuquerque/Newsletters/2014/2014-06.pdf>

# ARGUS C-135E Electro-Optical Testbed

Argus was the only USAF C-135E capable of flying extended missions up to 50,000 feet above the earth's surface, making it unique in the Air Force inventory. From 1996 to 2000, I supported its mission to collect data on rocket plume phenomena, reentry vehicle signatures, interceptor kill assessments, sensor checkout for SDI, and airborne laser remote sensing experiments.



**Korea Deployment**



**Tahiti Deployment**

## The American Institute of Aeronautics and Astronautics (AIAA) Congressional Visits Day

Every year, AIAA members – engineers, scientists, researchers, students, educators, and technology executives – travel to Washington DC, for aerospace advocacy and awareness with national decision makers. My group usually presents 2 key issues with recommendations:

- Aerospace & Defense Work-force Enhancement (& STEM)
- Aerospace & Defense Budget Funding and Procurement

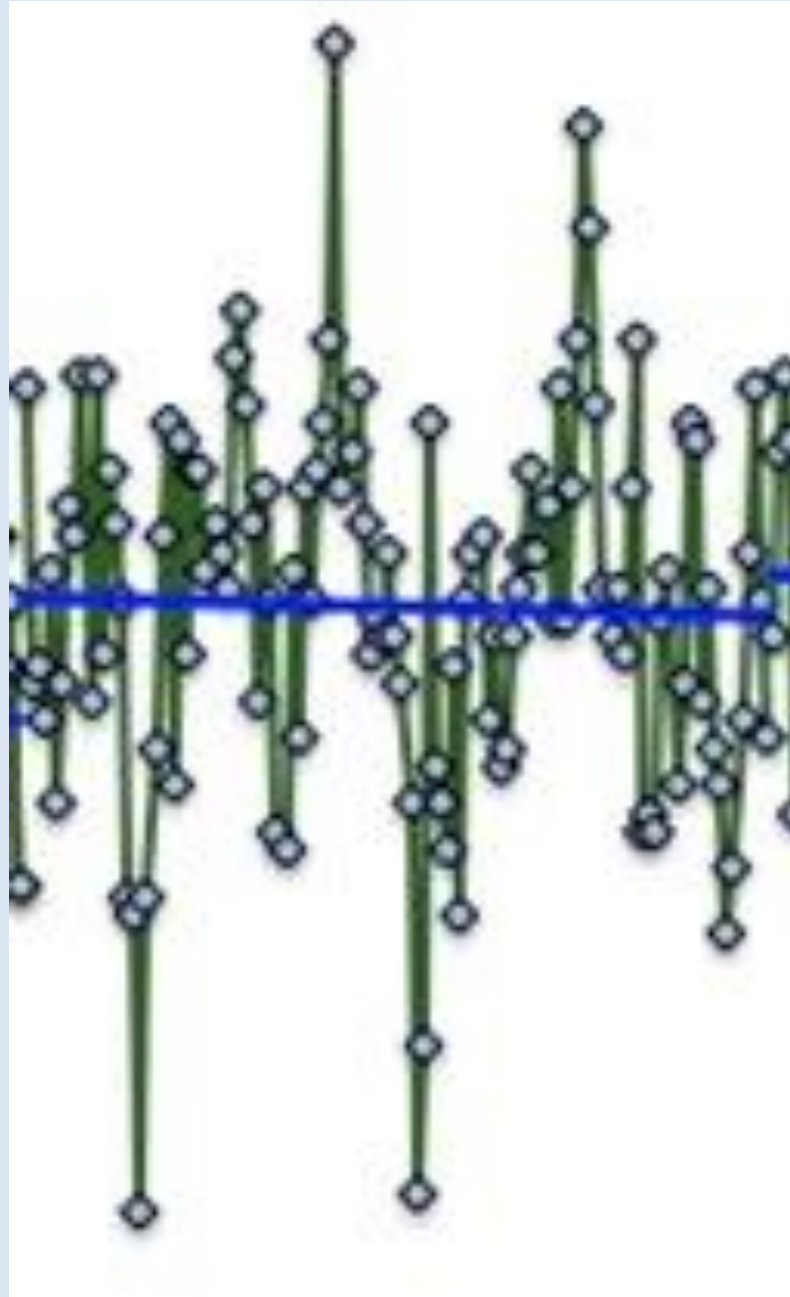


Here I am in DC with Ms. Cynthia Kaiser, former Directed Energy Chief Engineer at the Air Force Research Laboratory (AFRL), she is now involved with the AfterMath summer camp program for students; Col. Mark Neice (ret.), Executive Director of the Directed Energy Professional Society (DEPS), Col. Neice was Chief of the Laser Division at AFRL when I was a civilian crew member on the Argus C-135E electro-optical testbed aircraft (he was the pilot for Argus on many missions that I flew on including a deployment to South Korea); and our group leader Dr. James Horkovich (Directed Energy advocate).

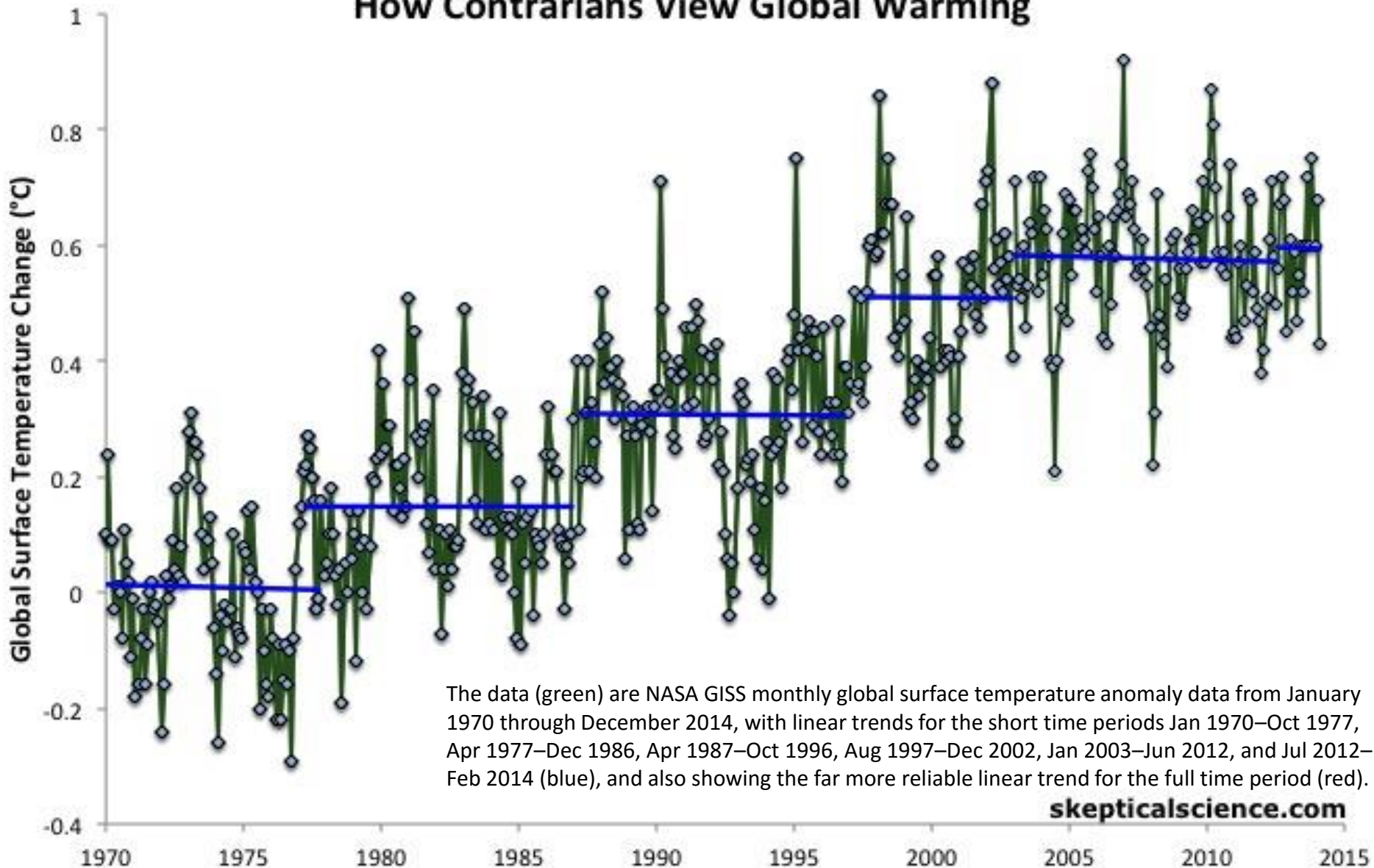
## Climate Change: The State of the Science (4 min)



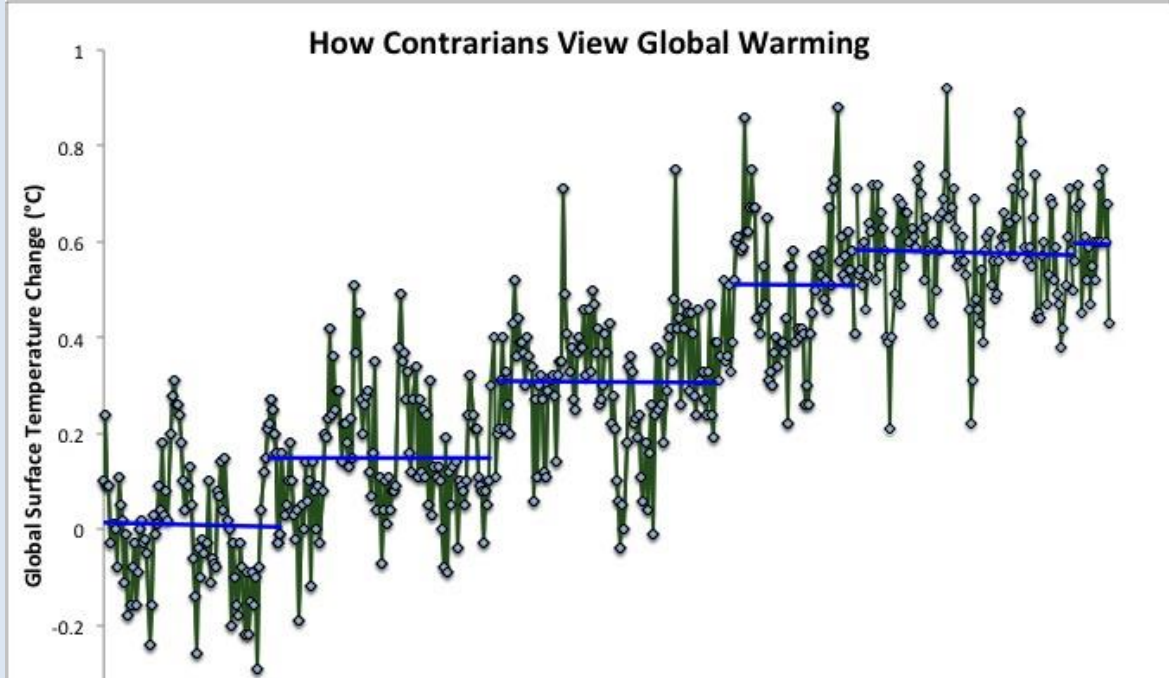
<https://www.youtube.com/watch?v= EWOrZQ3L-c>



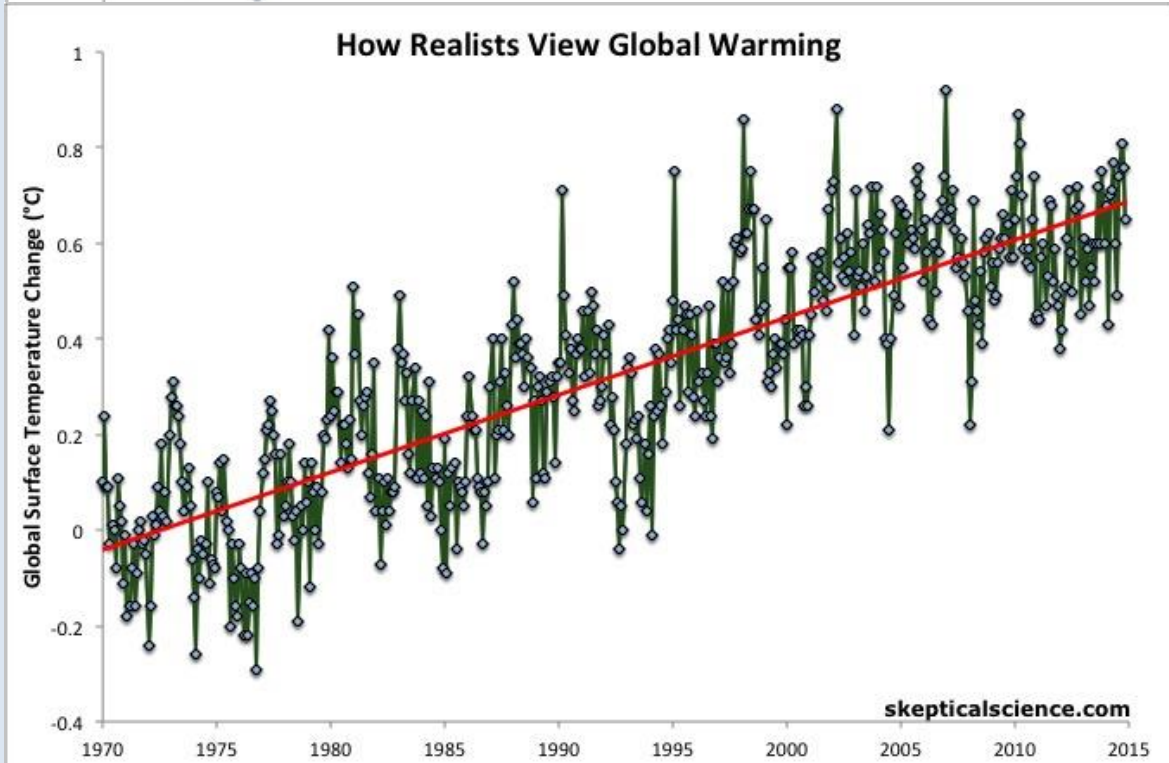
## How Contrarians View Global Warming



**Denialists:**



**Scientists:**





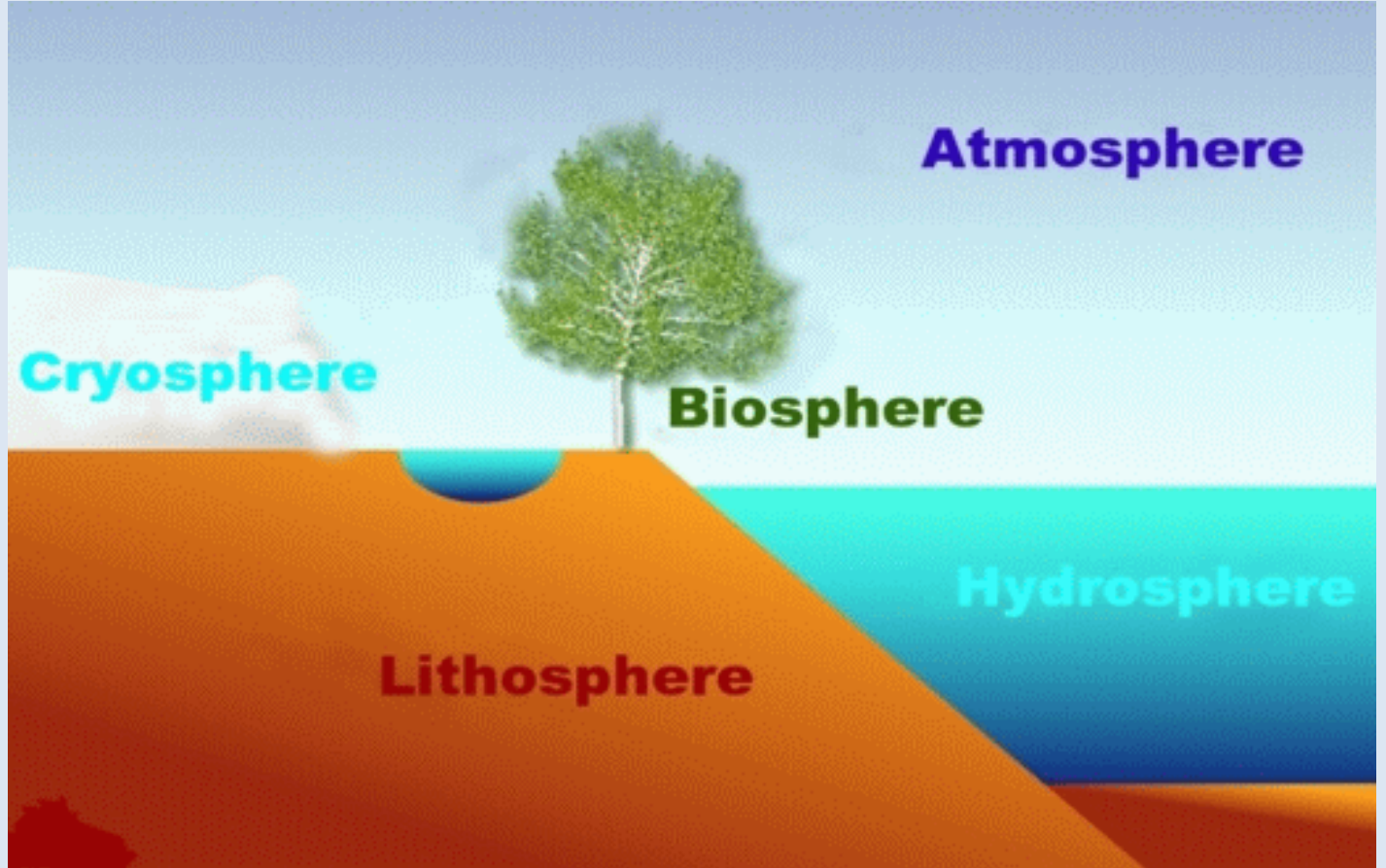
Atmosphere

Hydrosphere

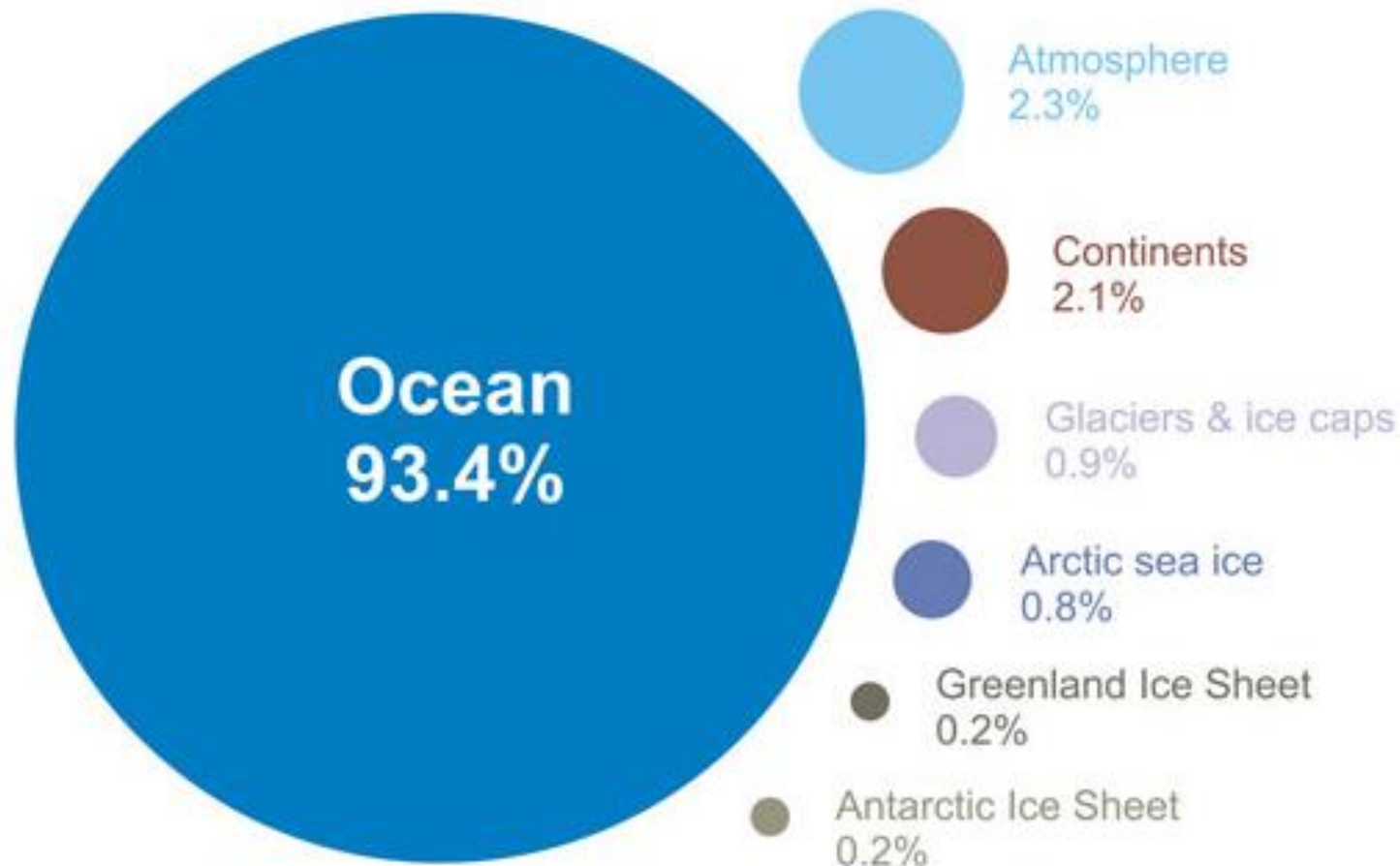
Cryosphere

Lithosphere

Biosphere



# Where is global warming going?



A visual depiction of how much global warming heat is going into the various components of the climate system for the period 1993 to 2003, calculated from IPCC AR4 5.2.2.3. Note that focusing on surface air temperatures misses more than 90% of the overall warming of the planet.

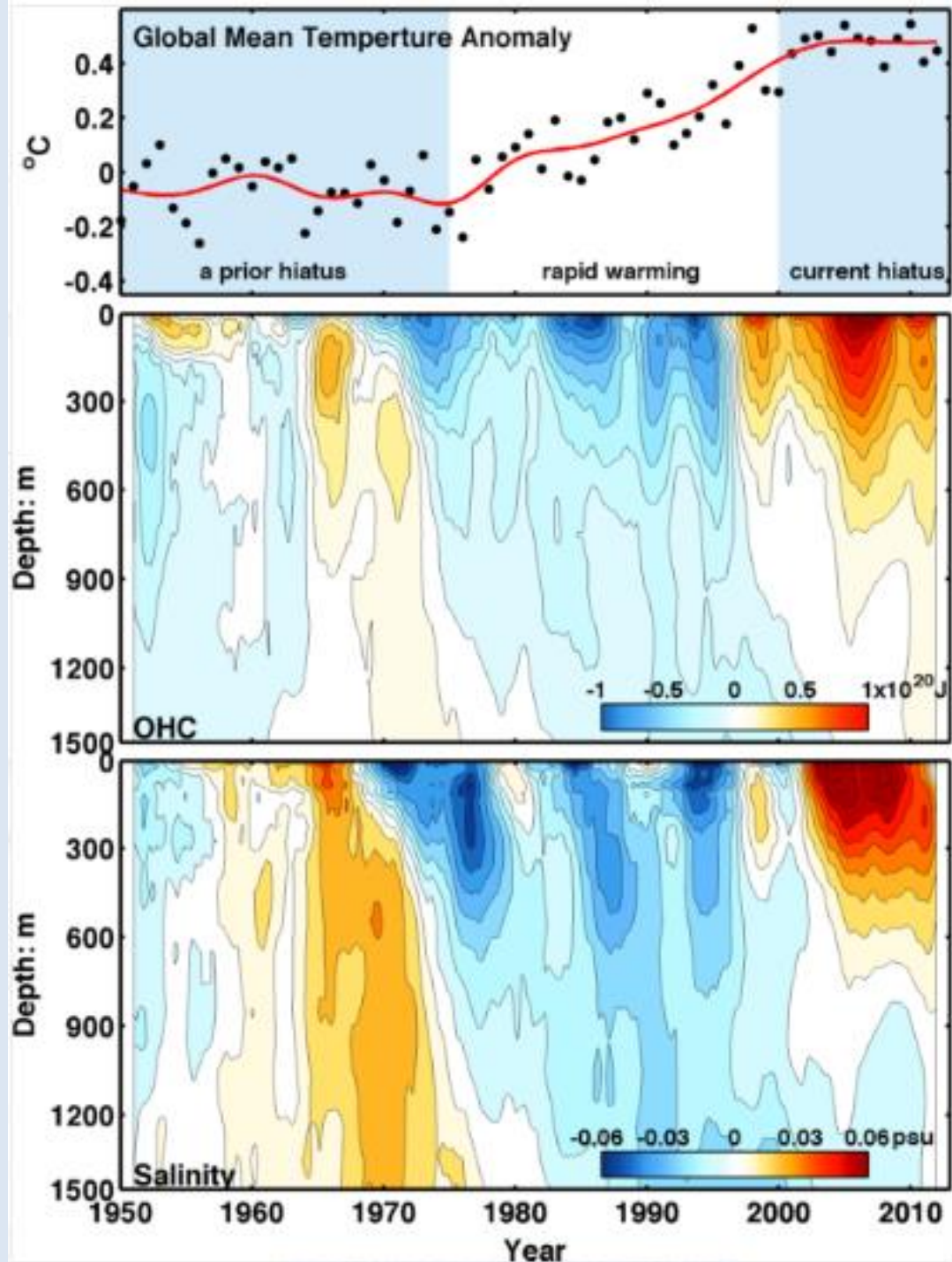
The atmosphere absorbs only 2% while the ocean absorbs over 90% of the heat energy. The surface “hiatus” is statistical, while the ocean has been heating up.

(Top) Global average surface temperatures, where black dots are yearly averages. Two flat periods (hiatus) are separated by rapid warming from 1976-1999.

(Middle) Observations of heat content, compared to the average, in the north Atlantic Ocean.

(Bottom) Salinity of the seawater in the same part of the Atlantic. Higher salinity is seen to coincide with more ocean heat storage.

K. Tung, Univ. of Washington



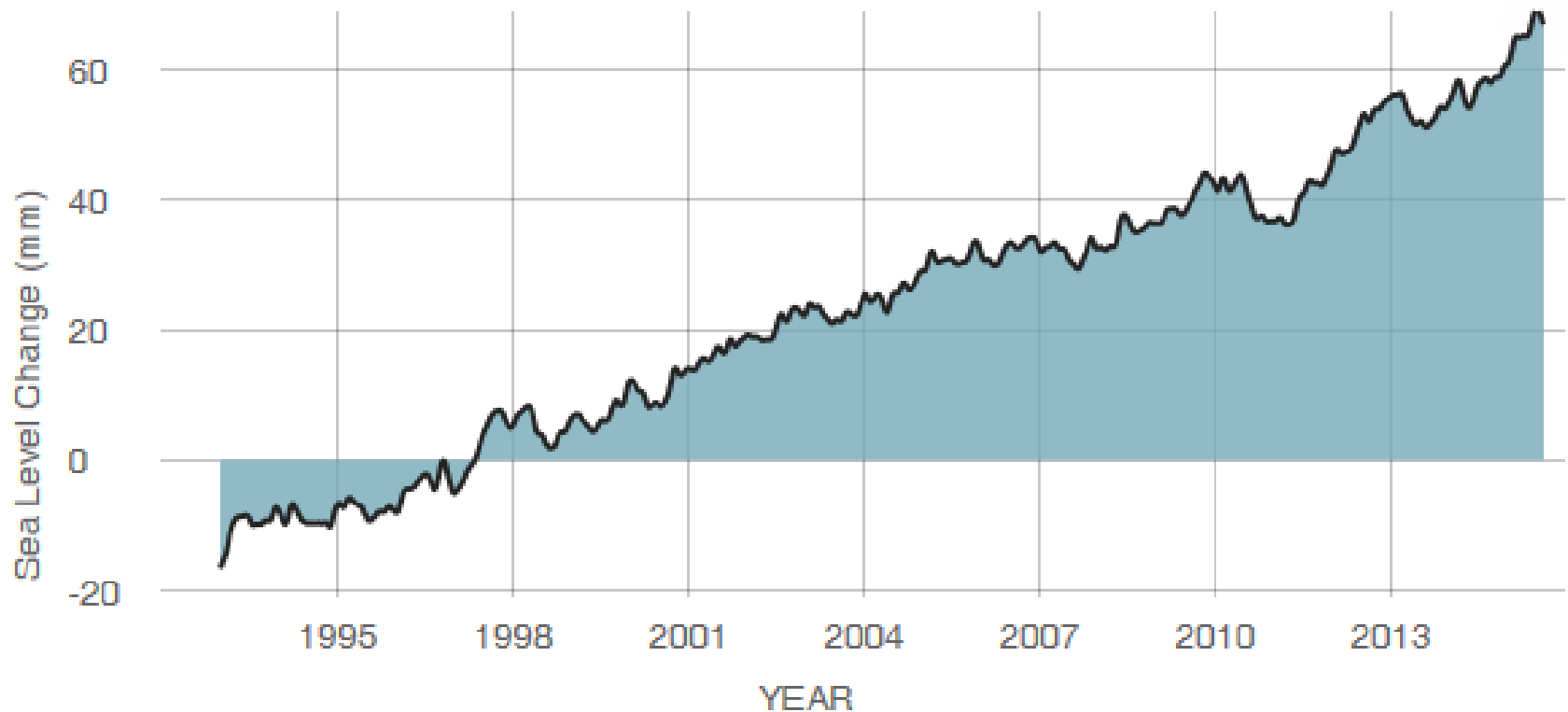
<http://www.washington.edu/news/2014/08/21/cause-of-global-warming-hiatus-found-deep-in-the-atlantic-ocean/>

## SATELLITE DATA: 1993-PRESENT

Data source: Satellite sea level observations.  
Credit: NASA Goddard Space Flight Center

RATE OF CHANGE

↑ **3.24**  
mm per year



## Animated map of what Earth would look like if all the ice melted (2:44)



[https://www.youtube.com/watch?v=VbiRNT\\_gWUQ](https://www.youtube.com/watch?v=VbiRNT_gWUQ)

<http://www.businessinsider.com/what-earth-would-look-like-if-ice-melted-world-map-animation-2015-2>

## Ocean Acidification by the Alliance for Climate Education (3 min)

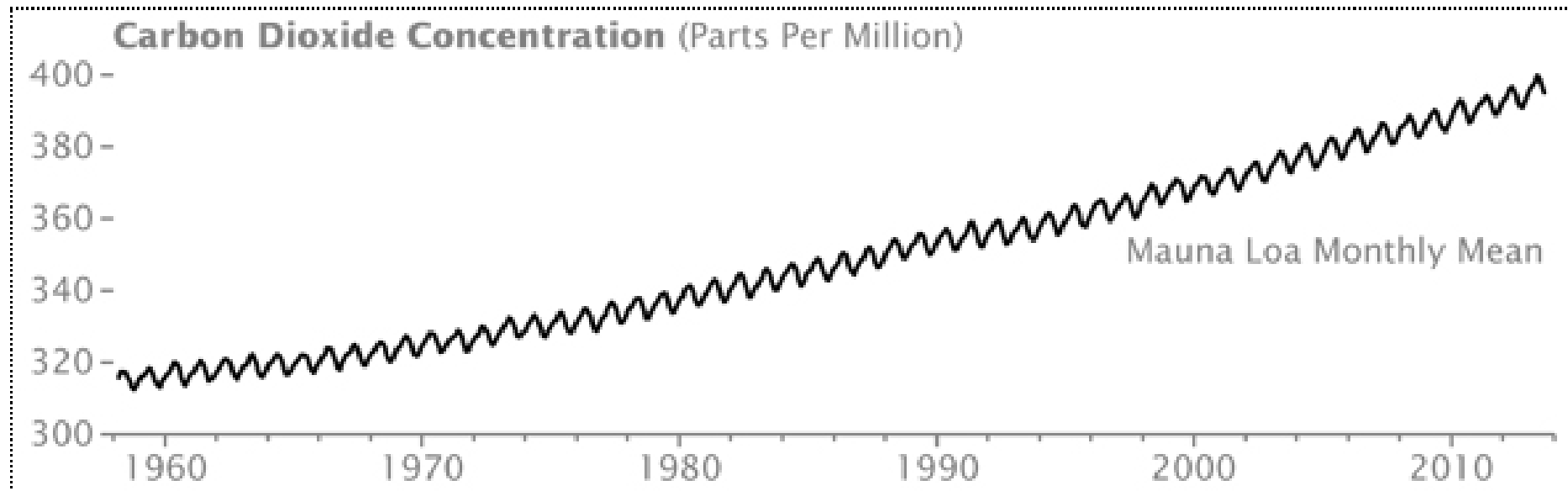
<https://www.youtube.com/watch?v=Wo-bHt1bOsw>



## NOAA Ocean Acidification - The Other Carbon Dioxide Problem (0-0:18)

<https://www.youtube.com/watch?v=MgdIAt4CR-4>

- **Atmospheric carbon dioxide levels are rising**, as are methane and nitrous oxide levels, and are higher now than they have been in *800,000* years.



Annual amount of atmospheric carbon dioxide (in parts per million), measured at Mauna Loa.

Graph by NOAA Earth System Research Laboratory

[http://www.slate.com/blogs/bad\\_astronomy/2013/09/30/climate\\_change\\_it\\_s\\_real\\_and\\_it\\_s\\_us.html](http://www.slate.com/blogs/bad_astronomy/2013/09/30/climate_change_it_s_real_and_it_s_us.html)

## Climate 101 with Bill Nye (4.5 min)

“Take Climate 101 with Bill Nye (the Science Guy) and you'll be schooled in the scientific fundamentals of climate change in under 5 minutes. Separate fact from fiction, and we can end the debate and denial and move on to solutions, together.”



<https://www.youtube.com/watch?v=3v-w8Cyfoq8>

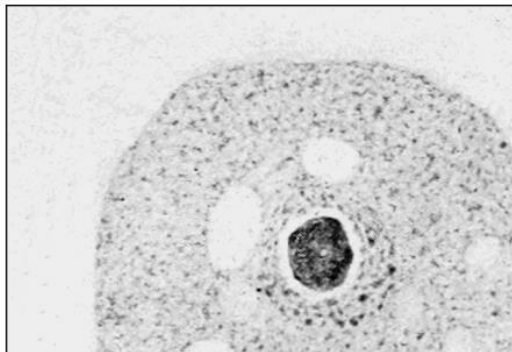
<https://www.climaterealityproject.org/climate-101>



US/WORLD

# Brain-Eating Amoebas Invade US Lakes Due To Global Warming

Jun 27, 2013 09:30 PM By John Ericson



N = 133 cases  
1962-2014

<http://www.medicaldaily.com/brain-eating-amoebas-invade-us-lakes-due-global-warming-247224>

<https://www.cdc.gov/parasites/naegleria/state-map.html>

<http://www.nbcnews.com/news/us-news/algae-causing-sea-lion-brain-damage-california-study-shows-n479921>

Naegleria fowleri, "brain-eating amoeba" cases are on the rise in warmer waters.

**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People.™

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

## Naegleria fowleri – Primary Amebic Meningoencephalitis (PAM) – Amebic Encephalitis

**Naegleria fowleri**

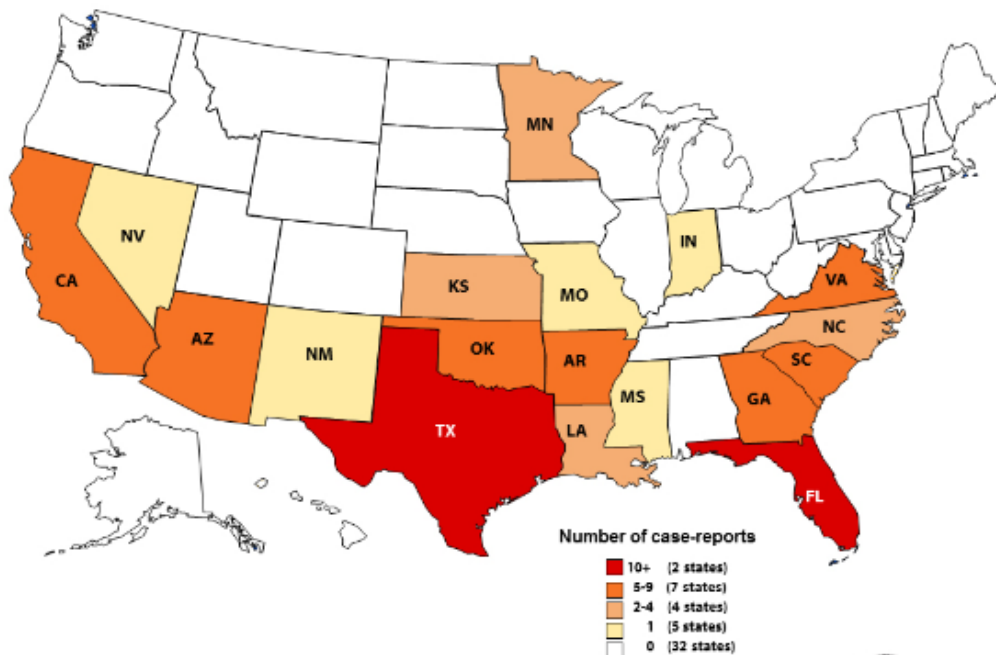
- En Español
- General Information
- Illness & Symptoms
- Pathogen & Environment
- Sources of Infection & Risk Factors
- Number of Case-reports by State of Exposure**
- Case-report Data & Graphs
- Diagnosis & Detection
- Treatment
- Prevention & Control
- Public Health & Medical Professionals
- Publications, Data, & Statistics
- Health Promotion Materials
- Newsroom, Features, & Announcements
- CDC at Work: *Naegleria fowleri*
- Policy & Recommendations

Parasites Home > *Naegleria fowleri* > Sources of Infection & Risk Factors



### Number of Case-reports of Primary Amebic Meningoencephalitis by State of Exposure

Number of Case-reports of Primary Amebic Meningoencephalitis Caused by *Naegleria fowleri* by State of Exposure\*– United States, 1962-2014



Nature.com  
July 2014

Current explanations  
are rapid melting of ice  
cores, methane builds  
up and explodes.

[http://www.nature.com/news/  
mysterious-siberian-crater-  
attributed-to-methane-  
1.15649](http://www.nature.com/news/mysterious-siberian-crater-attributed-to-methane-1.15649)

[https://www.google.com/search  
h?q=nature+mysterious+siberi  
an+craters&biw=1366&bih=65  
1&source=lnms&tbn=isch&sa  
=X&ved=0ahUKEwjz3OWN-  
ljRAhUpsFQKHQtVDeQQ\\_AUIBi  
gB&dpr=1](https://www.google.com/search?q=nature+mysterious+siberian+craters&biw=1366&bih=651&source=lnms&tbn=isch&sa=X&ved=0ahUKEwjz3OWN-ljRAhUpsFQKHQtVDeQQ_AUIBiGB&dpr=1)

# Mysterious Siberian crater attributed to methane

Build-up and release of gas from thawing permafrost most probable explanation, says Russian team.

Katia Moskvitch

31 July 2014

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A mystery crater spotted in the frozen Yamal peninsula in Siberia earlier this month was probably caused by methane released as permafrost thawed, researchers in Russia say.

Air near the bottom of the crater contained unusually high concentrations of methane — up to 9.6% — in tests conducted at the site on 16 July, says Andrei Plekhanov, an archaeologist at the Scientific Centre of Arctic Studies in Salekhard, Russia. Plekhanov, who led an expedition to the crater, says that air normally contains just 0.000179% methane.

Since the hole was spotted in mid-July by a helicopter pilot, conjecture has abounded about how the 30-metre-wide crater was formed — a gas or missile explosion, a meteorite impact and alien involvement have all been suggested.





## Climate change deniers: failsafe tips on how to spot them

Dr. Mark Hoofnagle, University of Virginia

Denialism is the employment of rhetorical tactics to give the appearance of argument or legitimate debate, when in actuality there is none. It is a process that operates by employing one or more of the following five tactics in order to maintain the appearance of legitimate controversy:

1. Conspiracy theories — Dismissing the data or observation by suggesting opponents are involved in "a conspiracy to suppress the truth".
2. Cherry picking — Selecting an anomalous critical paper supporting their idea, or using outdated, flawed, and discredited papers in order to make their opponents look as though they base their ideas on weak research.
3. False experts — Paying an expert in the field, or another field, to lend supporting evidence or credibility.
4. Moving the goalpost — Dismissing evidence presented in response to a specific claim by continually demanding some other (often unfulfillable) piece of evidence.
5. Other logical fallacies — Usually one or more of false analogy, appeal to consequences (emotion), straw man, or red herring (distraction).

(See Wikipedia: List of fallacies)

<http://www.theguardian.com/environment/blog/2009/mar/10/climate-change-denier>

[https://en.wikipedia.org/wiki/List\\_of\\_fallacies](https://en.wikipedia.org/wiki/List_of_fallacies)

## “If Global Warming Is a Hoax ...” By Phil Plait

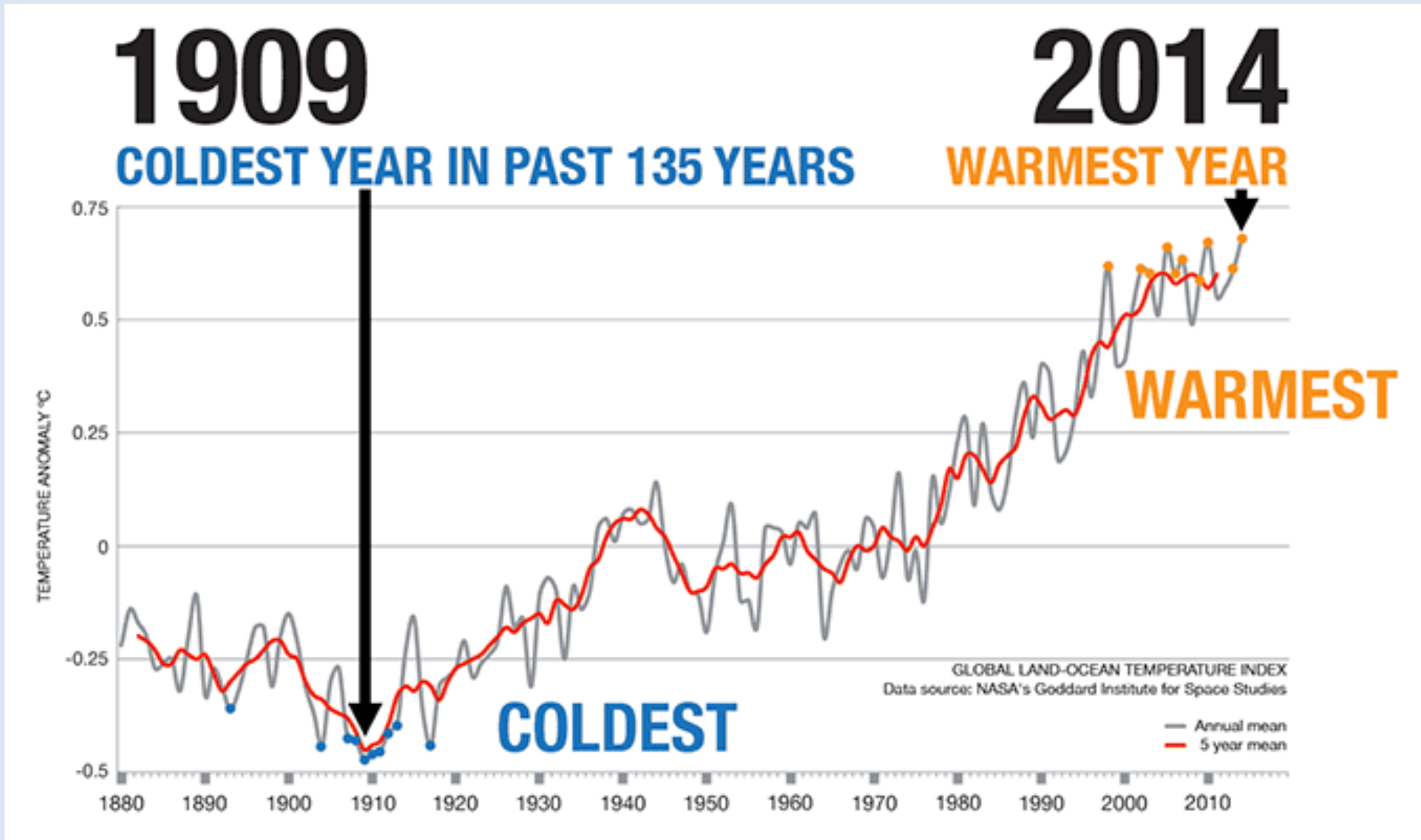
- ... then why was this September globally the hottest September on record by a substantial margin?
- ... then why were seven of the months in 2015 (so far!) the hottest of those months on record (February the hottest February on record, and so on)?
- ... then why is 2015 on track to be by far the hottest year on record?
- ... then why was the last warmest year on record just last year?
- ... then why are the 10 hottest years all since 1998?
- ... then why are we seeing far more high temperature records broken than lows?
- ... then why did summertime Arctic ice thin by more than 80 percent from 1975 to 2012?
- ... then why is Arctic sea ice volume dropping so fast it's called a “death spiral”?
- ... then why is the percentage of older ice in the Arctic dropping?
- ... then why are we losing 450 billion tons of land ice every year?
- ... then why have we lost 5 trillions tons of land ice just since 2002?
- ... then why are Earth's sea levels rising by more than 3 millimeters per year?
- ... then why are the oceans getting more acidic?
- ... then why are the vast majority of glaciers across the planet melting?
- ... then why do at least 97 percent, and perhaps as high as 99.9 percent of climate scientists say it's real?
- ... then why don't climate change deniers publish papers?
- ... then why do global warming deniers keep using long-falsified claims?

[http://www.slate.com/blogs/bad\\_astronomy/2015/10/28/global\\_warming\\_if\\_it\\_s\\_a\\_hoax.html](http://www.slate.com/blogs/bad_astronomy/2015/10/28/global_warming_if_it_s_a_hoax.html)



# NASA: Global Climate Change

## Ten coldest and warmest years



## How climate change deniers got it right — but very wrong” , by Tony Dokoupil

It turns out the climate change deniers were right: There isn't 97% agreement among climate scientists. The real figure? It's not lower, but actually higher.

The scientific “consensus” on climate change has gotten stronger, surging past the famous — and controversial — figure of 97% to more than **99.9%**, according to a new study.

James L. Powell, director of the National Physical Sciences Consortium, reviewed more than 24,000 peer-reviewed papers on global warming published in 2013 and 2014. Only five reject the reality of rising temperatures or the fact that human emissions are the cause, he found.

“It's now a ruling paradigm, as much an accepted fact in climate science as plate tectonics is in geology and evolution is in biology,” he told msnbc. “It's 99.9% plus.” Powell, a member of the National Science Board under Presidents Ronald Reagan and George H.W. Bush, decided to share an exclusive draft of his research on Tuesday — just days before Pope Francis is set to deliver a major address on climate change — because he doesn't want his holiness to reference outdated numbers.

“I don't want the Pope to say 97%,” Powell said by phone, arguing that accuracy now is more important than ever.

<http://www.msnbc.com/msnbc/how-climate-change-deniers-got-it-very-wrong>

## The 97 Percent: Watch John Oliver's Hilarious 'Statistically Representative Climate Change Debate' (4.5 min)



<http://thinkprogress.org/climate/2014/05/12/3436771/john-oliver-climate-change-debate/>  
<https://www.youtube.com/watch?v=m74EBa7UOP8>





Search...



### MOST USED Climate Myths

and what the science really says...

- 1 Climate's changed before
- 2 It's the sun
- 3 It's not bad
- 4 There is no consensus
- 5 It's cooling
- 6 Models are unreliable
- 7 Temp record is unreliable
- 8 Animals and plants can adapt
- 9 It hasn't warmed since 1998
- 10  Look up a Term

## Explaining climate change science & rebutting global warming misinformation

Scientific skepticism is healthy. Scientists should always challenge themselves to improve their understanding. Yet this isn't what happens with climate change denial. Skeptics vigorously criticise any evidence that supports man-made global warming and yet embrace any argument, op-ed, blog or study that purports to refute global warming. This website gets skeptical about global warming skepticism. Do their arguments have any scientific basis? What does the peer reviewed scientific literature say?

Newcomers,  
start here

History of  
Climate Science

The Big  
Picture

## Betting against global warming is a sure way to lose money

Posted on 8 December 2015 by dana1981

In 2008, a paper was published in the journal Nature predicting that global surface temperatures would cool slightly in the years 2005–2015 as compared to 1994–2004. The authors of that paper thought that during that time, the cool phase of natural ocean cycles would be enough to more than offset warming from the increased greenhouse effect, before human-caused global warming caught up again thereafter. At the time, the paper and its cooling prediction received a tremendous amount of media attention.



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**JULY 1**  
Making sense of climate science denial  
**ENROL NOW!**

**97 HOURS OF CONSENSUS**



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## Global Warming & Climate Change Myths

Here is a summary of global warming and climate change myths, sorted by recent popularity vs what science says. Click the response for a more detailed response. You can also view them sorted by taxonomy, by popularity, in a print-friendly version, with short URLs or with fixed numbers you can use for permanent references.

	Climate Myth	vs	What the Science Says	
1	"Climate's changed before"		Climate reacts to whatever forces it to change at the time; humans are now the dominant forcing.	
2	"It's the sun"		In the last 35 years of global warming, sun and climate have been going in opposite directions	
3	"It's not bad"		Negative impacts of global warming on agriculture, health & environment far outweigh any positives.	
4	"There is no consensus"		97% of climate experts agree humans are causing global warming.	
5	"It's cooling"		The last decade 2000-2009 was the hottest on record.	

### MOST USED Climate Myths and what the science really says...

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- 6 Models are unreliable
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**Skeptical Science**  
*Getting skeptical about global warming skepticism*

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**MOST USED Climate Myths**  
*and what the science really says...*

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- 10 [Look up a Term](#)



### Sun & climate: moving in opposite directions

#### What the science says...

Select a level... **Basic** Intermediate Advanced [Link to this page](#)

In the last 35 years of global warming, sun and climate have been going in opposite directions.

#### Climate Myth...

**It's the sun**  
"Over the past few hundred years, there has been a steady increase in the numbers of sunspots, at the time when the Earth has been getting warmer. The data suggests solar activity is influencing the global climate causing the world to get warmer." (BBC)

Over the last 35 years the sun has shown a slight cooling trend. However global temperatures have been increasing. Since the sun and climate are going in opposite directions scientists conclude the sun cannot be the cause of recent global warming.

The only way to blame the sun for the current rise in temperatures is by cherry picking the



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# Skeptical Science

Getting skeptical about global warming skepticism



Home Arguments S

Search... GO



## MOST USED Climate Myths

and what the science really says...

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+ Look up a Term

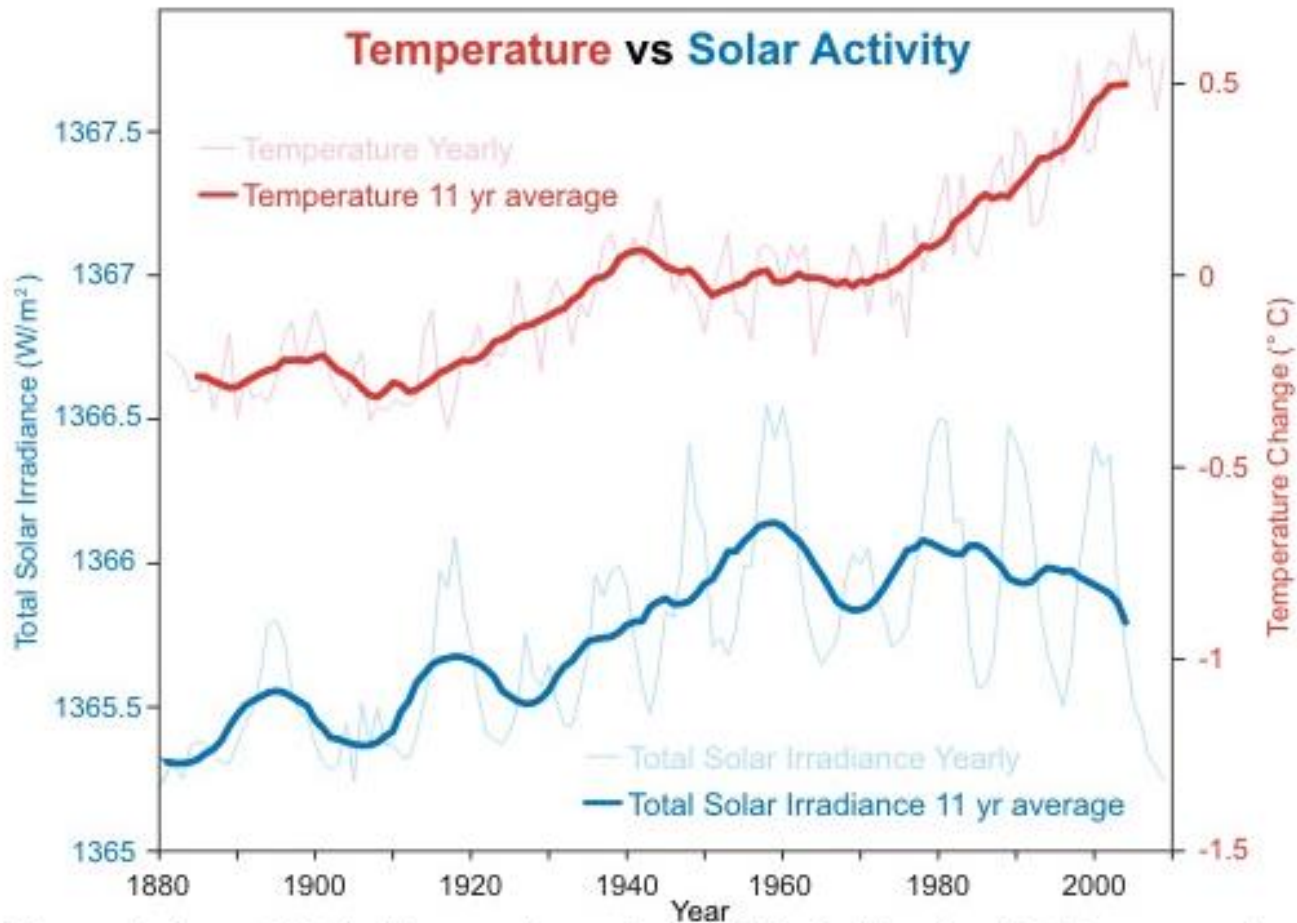


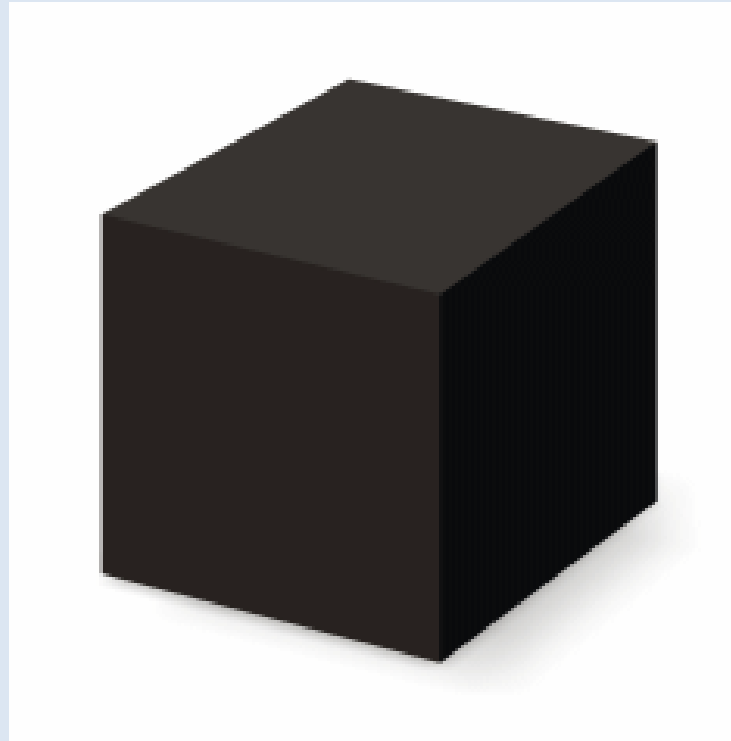
Figure 1: Annual global temperature change (thin light red) with 11 year moving average of temperature (thick dark red). Temperature from NASA GISS. Annual Total Solar Irradiance (thin light blue) with 11 year moving average of TSI (thick dark blue). TSI from 1880 to 1978 from Krivova et al 2007 (data). TSI from 1979 to 2009 from PMOD (see the PMOD index page for data updates).

**University of Michigan's Paul N. Edwards: 3 most dangerous falsehoods (2 min)**

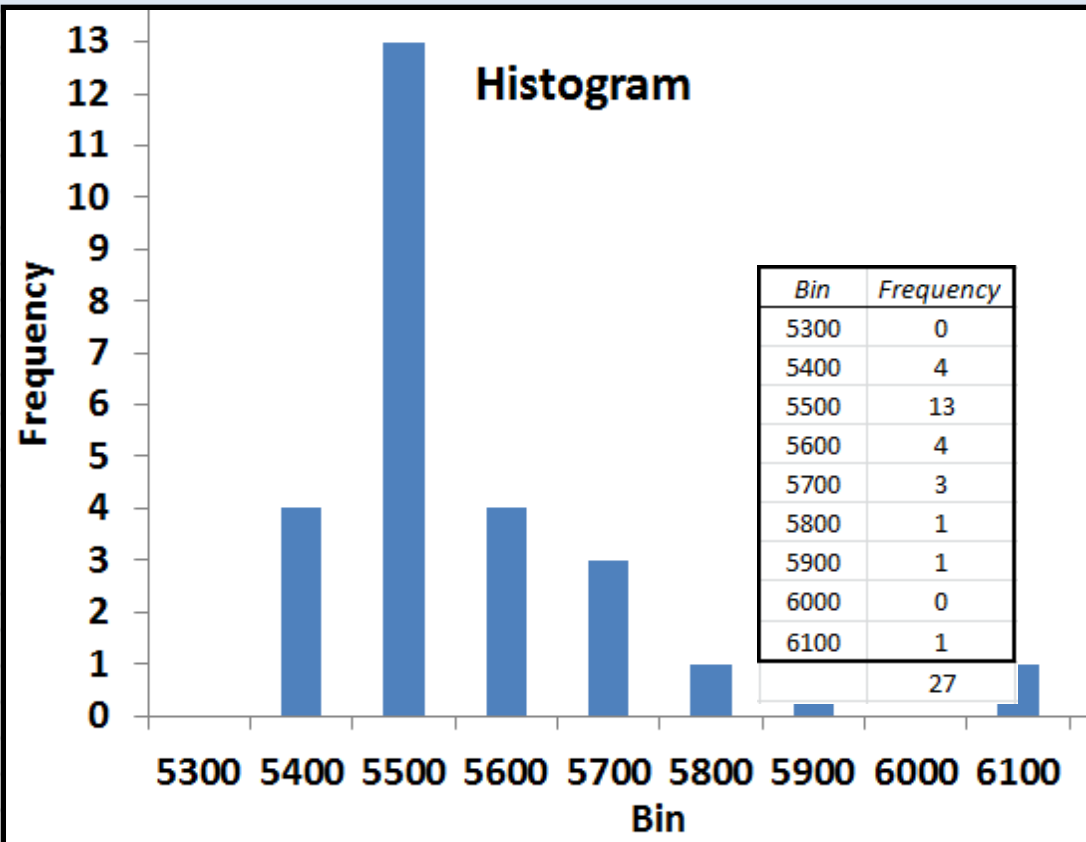


[https://www.youtube.com/watch?v=HD5ar\\_YQdtE](https://www.youtube.com/watch?v=HD5ar_YQdtE)

# What is the Volume of a Box?



Name	short A (cm)	mid B (cm)	long C (cm)	V=abc Vol (cm <sup>3</sup> )	%Diff
HUG	11.80	18.60	27.70	6080.	10.2%
GUT	11.05	18.92	27.75	5802.	5.2%
NGU	11.25	18.30	27.80	5723.	3.7%
ABE	11.00	18.80	27.50	5687.	3.1%
PRIC	10.80	19.00	27.50	5643.	2.3%
PAJ	10.79	18.89	27.59	5623.	1.9%
BLAI	10.80	18.70	27.50	5554.	0.67%
BECI	10.71	18.91	27.31	5531.	0.26%
GEO	10.70	18.60	27.70	5513.	-0.07%
DOR	10.69	18.60	27.71	5510.	-0.13%
CRAI	10.76	18.51	27.65	5507.	-0.18%
KOR	10.70	18.60	27.50	5473.	-0.79%
RIES	10.80	18.60	27.20	5464.	-1.0%
COH	10.69	18.57	27.52	5463.	-1.0%
HERI	10.80	18.40	27.40	5445.	-1.3%
JIME	10.80	18.50	27.20	5435.	-1.5%
GAR	10.70	18.60	27.30	5433.	-1.5%
TRU	10.70	18.60	27.30	5433.	-1.5%
KAS	10.75	18.60	27.10	5419.	-1.8%
FRAI	10.61	18.58	27.47	5415.	-1.8%
COR	10.75	18.52	27.19	5413.	-1.9%
CHA	10.60	18.49	27.59	5407.	-2.0%
MAR	10.60	18.75	27.20	5406.	-2.0%
THIE	10.59	18.49	27.60	5404.	-2.0%
CHA	10.70	18.50	27.25	5394.	-2.2%
BAD	10.75	18.40	27.25	5390.	-2.3%
DEE	10.73	18.51	27.13	5388.	-2.3%
(% 2nd dec 0's	52%	59%	56%	)	
Max =	11.80	19.00	27.80	6080	
Min =	10.59	18.30	27.10	5388	
	(cm)	(cm)	(cm)	(cm <sup>3</sup> )	
Mean =	10.80	18.61	27.44	5517	
StDev =	±0.245	±0.170	±0.210	±157.8	
	±2.3%	±0.9%	±0.8%	±2.9%	



I ask my students to measure the dimensions of a box, then later in the semester I show them the data and ask them “What is the volume of this box?” I pretend to be a “Volume Denier” etc. and refuse to accept their results until they can show me the volume with 100% accuracy... which leads to interesting discussions about their understanding of uncertainty.

# Uncertainty in Science.

At the end of the semester I send the my students the results with this summary:

**“The point is that any measurement will be statistical because you can never measure anything to an infinite number of decimal places. There is always uncertainty in science. You can never have perfect measurements – there will always be measurement error, which propagates up in any calculation.**

**So beware of anyone who tries to argue that the results of a scientific study cannot be trusted because there is not perfect certainty. This is a psychological tactic that was used by the tobacco industry (questioning the link between cancer and smoking), religious groups (questioning the evidence for the evolution of species), and now the oil industry and climate deniers (questioning the link between global warming and man-made emissions).**

**It is good to question everything - that is how science advances, but any argument should be done with knowledge, not ignorance. As Neil deGrasse Tyson said, the more educated you are, the less likely you can be taken advantage of by those who have an agenda. Good luck in your future adventures.”**



There is enough data now to show that extreme weather events are due to global warming. “Without exception, all the heat-related events studied in this year’s report were found to have been made more intense or likely due to human-induced climate change.”



<https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/>



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- Meetings & Events
- Public Policy

### Additional Publications

**Bulletin of the American Meteorological Society**  
Highly rated and widely read, the *Bulletin of the AMS*—our flagship magazine since 1920—showcases the revolution in science, service, and technology created by the AMS community.

**State of the Climate**  
An international, peer-reviewed publication released each summer, the *State of the Climate* is the authoritative annual summary of the global climate published as a supplement to the *Bulletin of the American Meteorological Society*.

**Journals**  
AMS publishes 11 journals which set the field’s standards for quality and influence. Read the latest articles and dig into our open archive of scientific achievement spanning 100 years.

Home / Publications / Magazine - BAMS / Explaining Extreme Events from a Climate Perspective

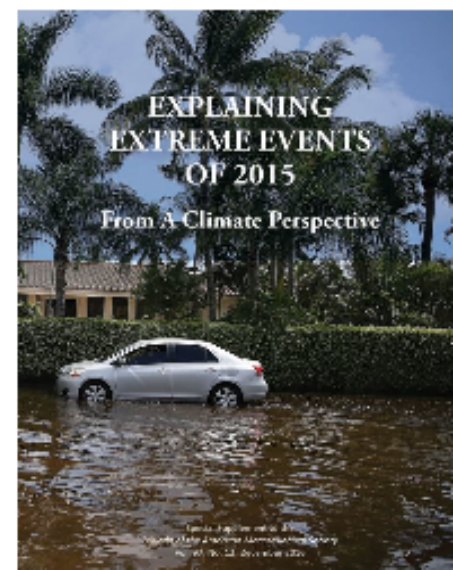
# Explaining Extreme Events from a Climate Perspective

This *BAMS* special report presents assessments of how climate change may have affected the strength and likelihood of individual extreme events.

This fifth edition of explaining extreme events of the previous year (2015) from a climate perspective continues to provide evidence that climate change is altering some extreme event risk. Without exception, all the heat-related events studied in this year’s report were found to have been made more intense or likely due to human-induced climate change, and this was discernible even for those events strongly influenced by the 2015 El Niño. Furthermore, many papers in this year’s report demonstrate that attribution science is capable of separating the effects of natural drivers including the strong 2015 El Niño from the influences of long-term human-induced climate change.

**DOWNLOAD EXPLAINING EXTREME EVENTS OF 2015**

Download high resolution version (44 MB).



## Jon Stewart's "Burn Notice" (2:46 to 10:37 min)

White House Science Advisor Dr. John Holdren  
testifying before the Committee on Science, Space, and Technology



<https://www.youtube.com/watch?v=IPgZfhnCAdl>

# GOP Senators and Representatives Band Together to Combat Climate Change and Its Denial

By Phil Plait



Sen. Kelly Ayotte, R-New Hampshire, is pro-environment, and one of a number of GOP members of Congress who accepts the reality of climate change.

[http://www.slate.com/blogs/bad\\_astronomy/2015/11/16/gop\\_science\\_some\\_republicans\\_are\\_bucking\\_their\\_party\\_about\\_climate\\_change.html](http://www.slate.com/blogs/bad_astronomy/2015/11/16/gop_science_some_republicans_are_bucking_their_party_about_climate_change.html)

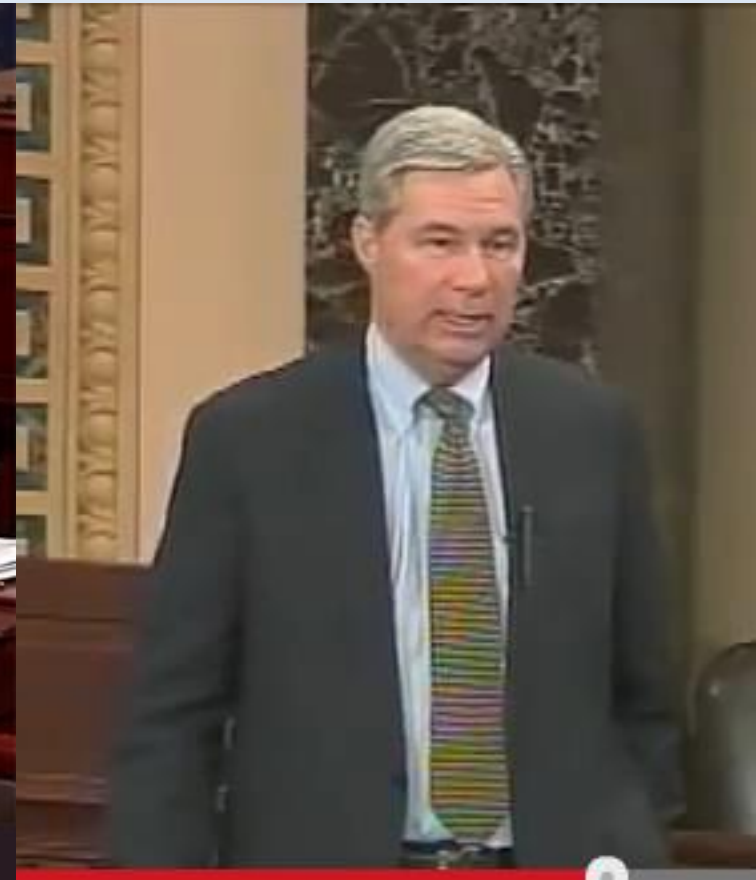
## I don't do Math, Emily Calandrelli, TEDxOregonStateU (5:30-6:45 14:47- of 16 min)

Science advocate Emily Calandrelli discusses the need for critical thinking and the dangers of electing STEM-illiterate representatives.



<https://www.youtube.com/watch?v=y44nqo11Fh0>

## Sen. Inhofe Throws Snowball In Senate, Sen. Whitehouse's reply.



### Inhofe Throws Snowball (1 min)

<https://www.youtube.com/watch?v=2aUfg1Tflkc>

[http://www.slate.com/blogs/bad\\_astronomy/2015/03/02/political\\_anti\\_science\\_a\\_week\\_of\\_nonsense.html](http://www.slate.com/blogs/bad_astronomy/2015/03/02/political_anti_science_a_week_of_nonsense.html)

### You Can Believe the Senator With a Snowball or Science (4 min)

<https://www.youtube.com/watch?v=oTdpdFUTyqs>

**NASA under 'Cruz' control, Ted Cruz, Michio Kaku (0:15-4:33, 5:56-7:10)**



<https://www.youtube.com/watch?v=pPQGCnuWcqc>

## Marco Rubio: Climate Change Is Not Man-Made (1 min)



<https://www.youtube.com/watch?v=-sGs8AwrREY>

**Marco Rubio: The science is not certain, climate always changing (1.5 min)**



<https://www.youtube.com/watch?v=p-NswFRDDeU>

<http://climatecrocks.com/2015/01/23/from-im-not-a-scientist-climate-denying-senator-morphs-to-we-cant-ignore-the-scientists-but/>



## Florida's emergency management director Bryan Koon avoiding forbidden language (2 min)

Four former officials at Florida's Department of Environmental Protection have claimed that Gov. Rick Scott put out an unwritten rule ordering that no one at the DEP even use the phrases "global warming" or "climate change" in any of their communications.



<https://www.youtube.com/watch?v=5hMCevgPGjY>

[http://www.slate.com/blogs/bad\\_astronomy/2015/03/26/global\\_warming\\_florida\\_governor\\_rick\\_scott\\_s\\_gag\\_order.html](http://www.slate.com/blogs/bad_astronomy/2015/03/26/global_warming_florida_governor_rick_scott_s_gag_order.html)

## **Senator Ted Cruz,**

“On the global warming alarmists, anyone who actually points to the evidence that disproves their apocalyptic claims, they don't engage in reasoned debate. What do they do? They scream, 'You're a denier.' They brand you a heretic. Today, the global warming alarmists are the equivalent of the flat-Earthers. It used to be [that] it is accepted scientific wisdom the Earth is flat, and this heretic named Galileo was branded a denier...

If you look at global warming alarmists, they don't like to look at the actual facts and the data. The satellite data demonstrate that there has been no significant warming whatsoever for 17 years. Now that's a real problem for the global warming alarmists. Because all those computer models on which this whole issue is based predicted significant warming, and yet the satellite data show it ain't happening.”

<https://www.washingtonpost.com/news/the-fix/wp/2015/03/25/ted-cruz-compares-climate-change-activists-to-flat-earthers-where-to-begin/>

**“An open letter from Galileo to Ted Cruz”, by Alexandra Petri**

[https://www.washingtonpost.com/blogs/compost/wp/2015/03/26/an-open-letter-from-galileo-to-ted-cruz/?utm\\_term=.61f2a3399469](https://www.washingtonpost.com/blogs/compost/wp/2015/03/26/an-open-letter-from-galileo-to-ted-cruz/?utm_term=.61f2a3399469)



### Program Description

In this two-hour special, NOVA celebrates the story of the father of modern science and his struggle to get Church authorities to accept the truth of his astonishing discoveries. The program is based on Dava Sobel's bestselling book, *Galileo's Daughter*, which reveals a new side to the famously stubborn scientist—that his closest confidante was his illegitimate daughter, Sister Maria Celeste, a cloistered nun.

The actor Simon Callow plays Galileo in dramatic reenactments of key moments from his life: his pioneering telescopic observations of the Moon and planets, his revolutionary experiments with falling objects, and his fateful trial before the Inquisition for heresy.

## Homework (50 pts)

- Write 22 facts in sentence form (2 facts from each part).

NOVA: Galileo's Battle for the Heavens (2 hrs)

<https://www.youtube.com/playlist?list=PL28AF597A9C90E18E>

<http://www.pbs.org/wgbh/nova/ancient/galileo-battle-for-the-heavens.html>

(There are some great related links on the NOVA site.)

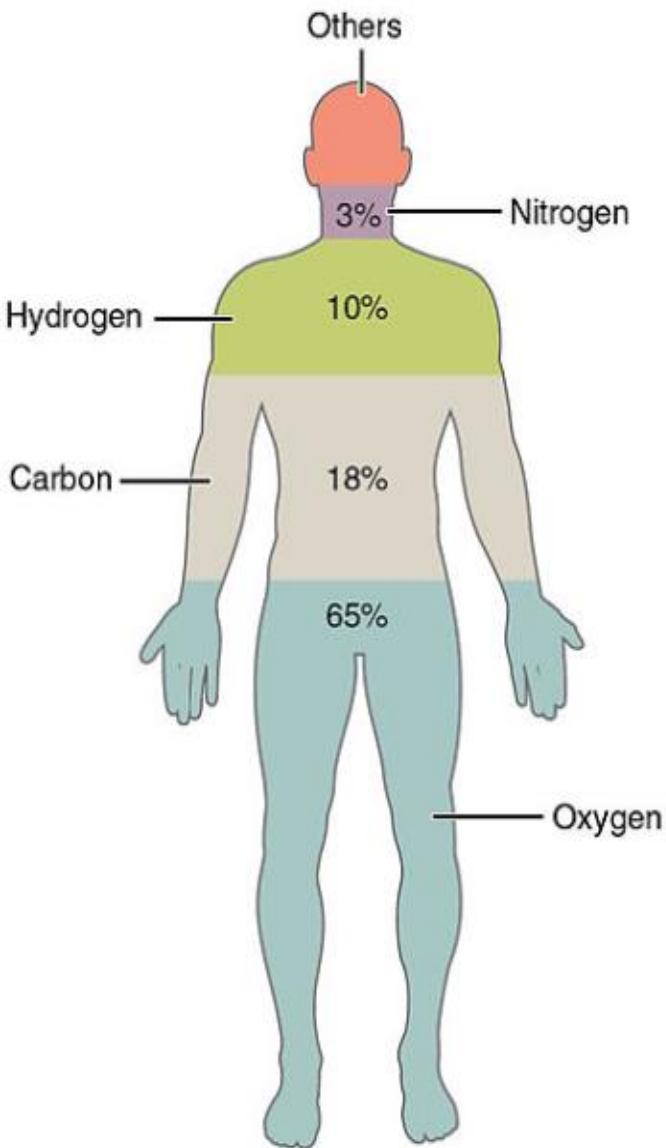
## NBC News Oct 28 2014, Pope Francis: Evolution and Big Bang Theory Are Real

<http://www.nbcnews.com/news/world/pope-francis-evolution-big-bang-theory-are-real-n235696>



► **Pope Francis: 'God Is Not a Magician With a Magic Wand'** 0:23 [f](#) [t](#) [g+](#) [</>](#)

Big Bang theory and evolution in nature "do not contradict" the idea of creation, Pope Francis has told an audience at the Vatican, saying God was not "a magician with a magic wand." The Pope's remarks on Monday to the Pontifical Academy of Sciences appeared to be a theological break from his predecessor Benedict XVI, a strong exponent of creationism.

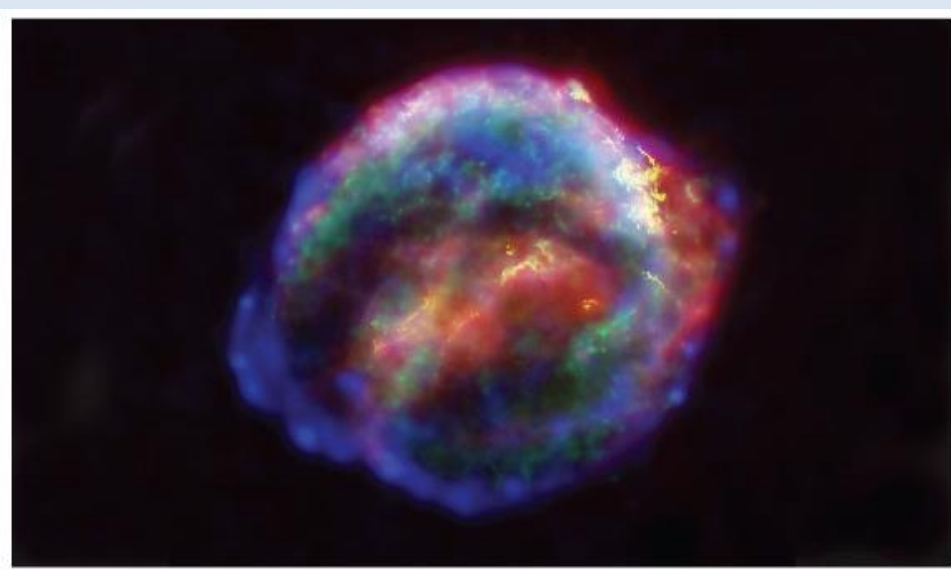


Element	Symbol	Percentage in Body
Oxygen	O	65.0
Carbon	C	18.5
Hydrogen	H	9.5
Nitrogen	N	3.2
Calcium	Ca	1.5
Phosphorus	P	1.0
Potassium	K	0.4
Sulfur	S	0.3
Sodium	Na	0.2
Chlorine	Cl	0.2
Magnesium	Mg	0.1
Trace elements include boron (B), chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), silicon (Si), tin (Sn), vanadium (V), and zinc (Zn).		less than 1.0

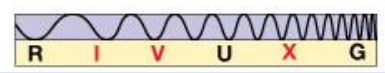
[https://en.wikipedia.org/wiki/Composition\\_of\\_the\\_human\\_body](https://en.wikipedia.org/wiki/Composition_of_the_human_body)

# A student asked me , “How do we know you’re not just making this stuff up?”

This theory of formation of new elements in supernova explosions produces a light curve that agrees quite well with observed curves:

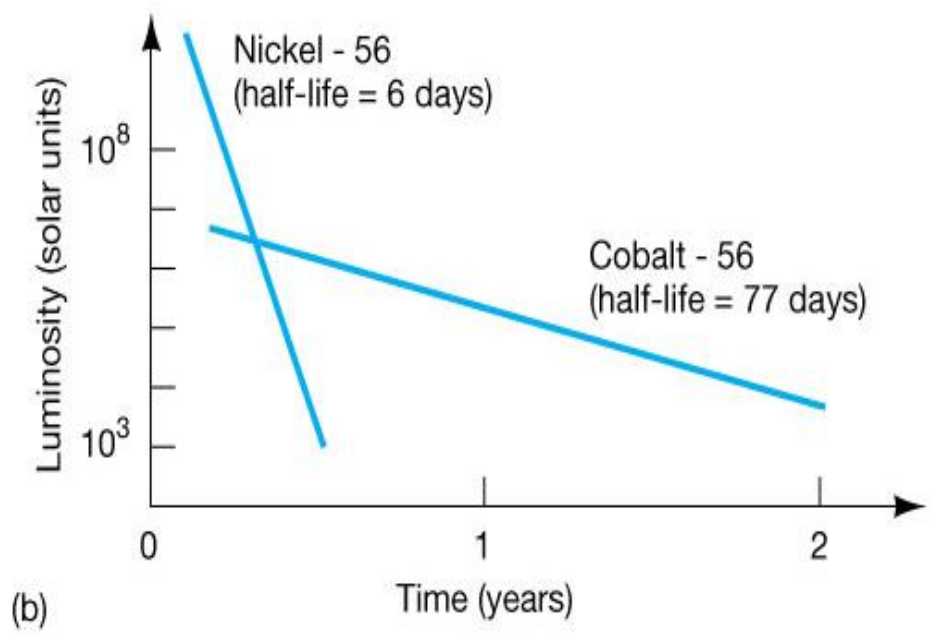
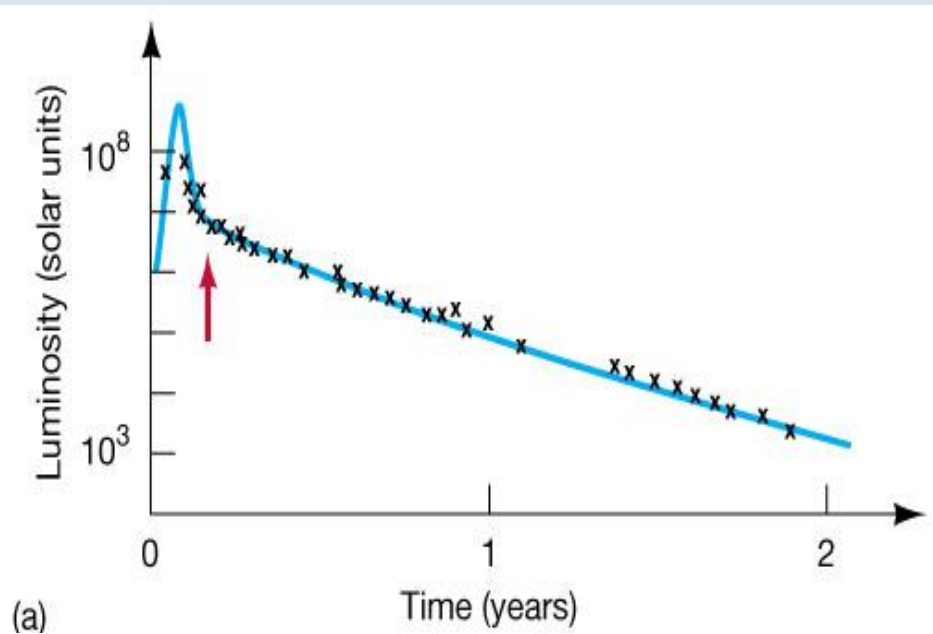


(c)



The crosses are the actual observations of the supernova’s light. Theoretical calculations of the light emitted by the radioactive decay of nickel-56 and cobalt-56 produce a light curve similar to those actually observed in real supernova explosions, lending strong support to the theory of stellar nucleosynthesis. This is a composite image of the remains of the Kepler supernova—the last such object seen to explode in our Milky Way Galaxy in 1604. about 3000 pc away, 4 pc , X-ray data are blue and green; infrared data are red; optical data are yellow.

“Astronomy Today” (7<sup>th</sup> ed., by Chaisson & McMillan)



## Stephen Colbert: Climate Change Deniers, “I am not a scientist” (4.5 min)

Oklahoma Republican James Inhofe gears up to chair the Senate's Environment and Public Works Committee despite literally writing the book on global warming denial.



<http://www.cc.com/video-clips/sc6mpp/the-colbert-report-the-republicans--inspiring-climate-change-message>

## Update: Rep. Lamar Smith Ramps Up His Climate Conspiracy

By Phil Plait



On Monday, I reported on a slimy attack on the National Oceanic and Atmospheric Administration by Rep. Lamar Smith, R-Texas. Smith is chairman of the House Committee on Science, Space, and Technology, and a man with his head firmly in the sand when it comes to global warming—an issue NOAA studies very carefully.

However, because NOAA understands that global warming is real, and has said so, they have become the target of Smith's ire. He has used his power of congressional subpoena to coerce the head of NOAA, Kathryn Sullivan, to hand over all data and emails from scientists on their use of global satellite data. This is clearly a fishing expedition; he's looking for ways to humiliate the agency, and also to tie them up in administrative knots.

In a **very harshly worded letter**, his co-committee member Eddie Bernice Johnson, D-Texas, accuses him of overreaching and abusing his power, noting (correctly) that neither he nor his staff is qualified to examine the data.

To me, this stinks of McCarthyism.

But now there's more news.

**Nature** is reporting that NOAA is refusing to comply with Smith's outrageous demands and "has no intention of handing over documents that reveal its internal deliberations."

[http://www.slate.com/blogs/bad\\_astronomy/2015/10/30/global\\_warming\\_lamar\\_smith\\_s\\_conspiracy\\_ideations.html](http://www.slate.com/blogs/bad_astronomy/2015/10/30/global_warming_lamar_smith_s_conspiracy_ideations.html)



## Bill Nye to Climate Change Deniers: You Can't Ignore Facts Forever (5 min)



<https://www.youtube.com/watch?v=dkR3TI6xyzU>

## Washington Post: “The 7 psychological reasons that are stopping us from acting on climate change”

- **Psychological Distance**

Things and events that are perceived as far in the future, physically distant, happening to other people, or involving uncertainty.

- **Finite Pool of Worry**

People are able to worry about only so much at any given point.

- **Emotional Numbing**

If communication efforts repeatedly expose people to emotionally draining messages and images, audiences may eventually stop responding emotionally altogether.

- **Confirmation Bias and Motivated Reasoning**

People also have a tendency to seek out or absorb only the information that matches their mental model, confirming what they already believe to be true.

- **Defaults**

We're also terribly biased in favor of the status quo, of doing things the way they've always been done. It's easier and simpler that way.

- **Discounting**

When scientists tell the public that sea levels will rise by several feet in the coming century, people's natural tendency to discount, compared with a long time scale, which can make the predicted rise seem inconsequential.

- **Ideology**

Finally, researchers have increasingly focused on ideology itself as a psychological phenomenon. After all, political beliefs are deeply felt and highly emotional, and yet we rarely even know why a certain conclusion feels so right to us, even as another person can feel just as strongly about the opposite view.

<http://www.washingtonpost.com/blogs/wonkblog/wp/2014/12/11/the-7-psychological-reasons-that-are-stopping-us-from-acting-on-climate-change/>



A GRIST SPECIAL SERIES

# How to Talk to a Climate Skeptic: Responses to the most common skeptical arguments on global warming

Below is a complete listing of the articles in “How to Talk to a Climate Skeptic,” a series by Coby Beck containing responses to the most common skeptical arguments on global warming. There are four separate taxonomies; arguments are divided by:

- **Stages of Denial,**
- **Scientific Topics,**
- **Types of Argument,** and
- **Levels of Sophistication.**

## UQx DENIAL101x 6.2.6.1 From the experts: Psychology of denial (7.5 min)



<https://www.youtube.com/watch?v=9It19FHt50g>

- **Time: “The Battle Over Global Warming Is All in Your Head”**

<http://science.time.com/2013/08/19/in-denial-about-the-climate-the-psychological-battle-over-global-warming/>

- **Psychology Today: “Climate Change Denial – Why don’t politicians recognize that humans cause global warming?”**

<https://www.psychologytoday.com/blog/hot-thought/201108/climate-change-denial>

- **Nature: “Promoting pro-environmental action in climate change deniers”**

[http://www.researchgate.net/publication/254864098\\_Promoting\\_pro-environmental\\_action\\_in\\_climate\\_change\\_deniers](http://www.researchgate.net/publication/254864098_Promoting_pro-environmental_action_in_climate_change_deniers)

- **Personality and Individual Differences: “Ideology and climate change denial”**

[http://www.researchgate.net/publication/263850647\\_Ideology\\_and\\_climate\\_change\\_denial](http://www.researchgate.net/publication/263850647_Ideology_and_climate_change_denial)

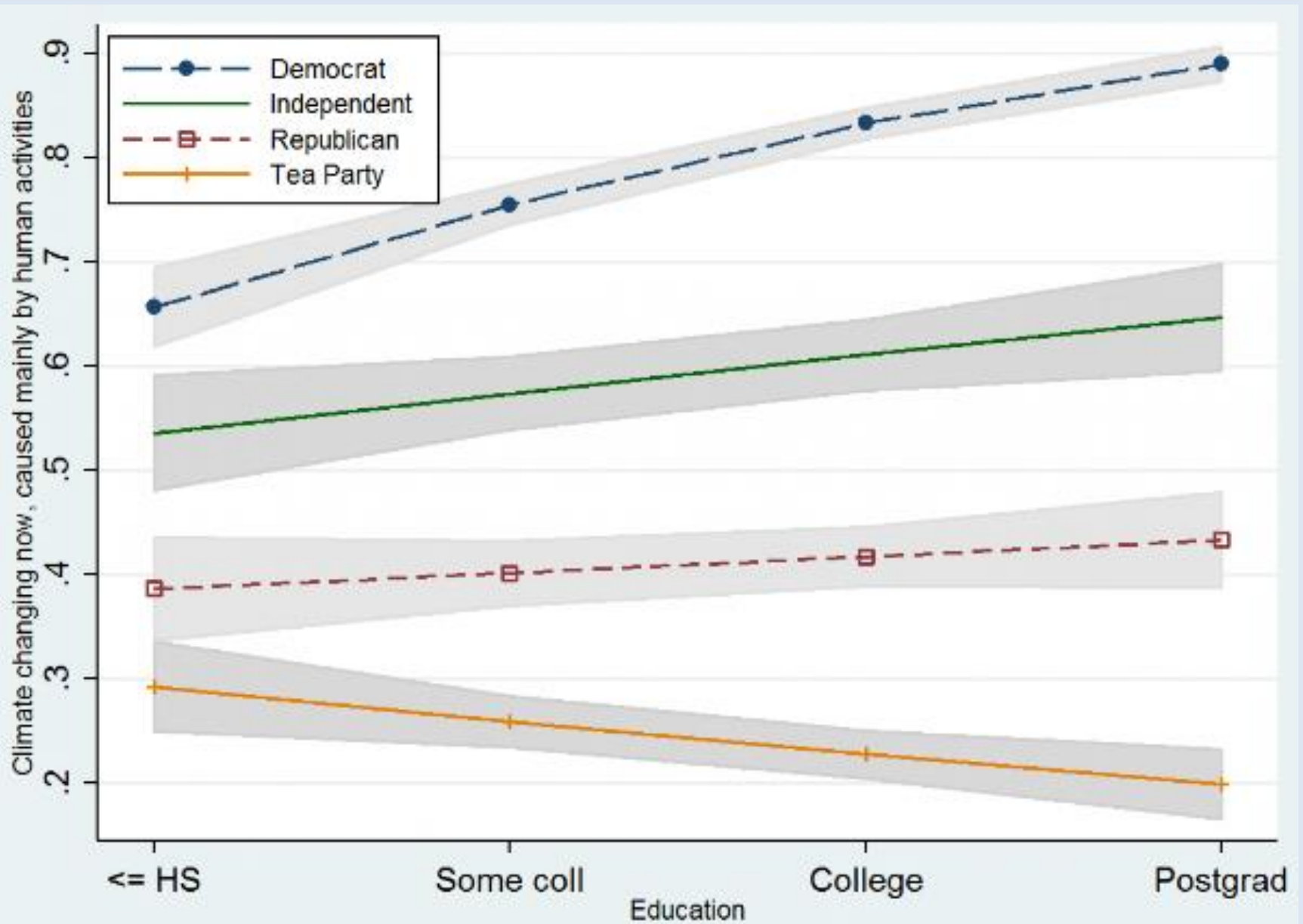
- **Journal of Environmental Psychology: “Future-oriented women will pay to reduce global warming: Mediation via political orientation, environmental values, and belief in global warming”**

[http://www.researchgate.net/publication/266976175\\_Future-oriented\\_women\\_will\\_pay\\_to\\_Reduce\\_Global\\_Warming\\_Mediation\\_via\\_political\\_orientation\\_Environmental\\_Values\\_and\\_Belief\\_in\\_Global\\_Warming](http://www.researchgate.net/publication/266976175_Future-oriented_women_will_pay_to_Reduce_Global_Warming_Mediation_via_political_orientation_Environmental_Values_and_Belief_in_Global_Warming)

- **Cognition: How Your Mind Can Amaze and Betray You – Crash Course Psychology #15 with Hank Green (11 min)**

<https://www.youtube.com/watch?v=R-sVnmmw6WY>

## Acceptance of anthropogenic climate change vs education level:



## RealClimate: Doubts about the Advent of Spring, 1 April 2005

A “consensus view” amongst climate scientists holds that the Northern Hemisphere will be warming this month, as spring is coming. .. due to the Earth’s orbit around the sun and the inclination of the Earth’s axis, tilting the Northern Hemisphere progressively towards the sun throughout March and April and increasing the amount of solar radiation received at northern latitudes.

In a new novel, *State of Euphoria*, bestselling author Michael Crikey uncovers major flaws in this theory and warns against false hopes for the arrival of spring. This is not merely fiction: Crikey underpins his thesis with numerous scientific diagrams. He presents measurements from over a dozen weather stations in the Northern Hemisphere where temperatures show a cooling trend in March. He further cites scientific results which show that in some places, snow and ice have increased in the past weeks, counter to climatologists’ claims that they should be melting away in the spring sun. He further argues that even the average temperature of the Northern Hemisphere has not increased steadily; during one week of March, it showed a slight cooling despite the increase in solar radiation.

“This casts a grave shadow of doubt on the theory of the seasons”, says Crikey. “Consensus science is not good science.” He says we should not trust computer models projecting that June will be much warmer than March in most of the Northern Hemisphere. “These models cannot even predict the weather in two weeks time – why should we believe what they say about temperatures in two months?” He also says that only six months ago, scientists were predicting a cooling. “Nobody can predict the future,” asserts Crikey. Farmers risk wasting billions of dollars if they trust the warming forecast; Crikey urges them to wait with sowing until it is clear that summer temperatures have indeed arrived.

Crikey argues that climatologists cling to the ill-founded theory of seasons for political reasons. “Scientists have promoted their orbital theory of seasons for centuries without questioning it,” says Crikey. “It has become like a dogma. They cannot admit that it is wrong without suffering a serious setback in credibility and research funding”.

... In an emotional speech, Senator Outhofe urged his colleagues to take the time for reading the novel. He called seasons a “great hoax” and emphasised that “science is overwhelmingly on the side that, in fact, they are not occurring, and if they are occurring, are not a result of the Earth’s orbit”....

<http://www.realclimate.org/index.php/archives/2005/04/doubts-about-the-advent-of-spring/>

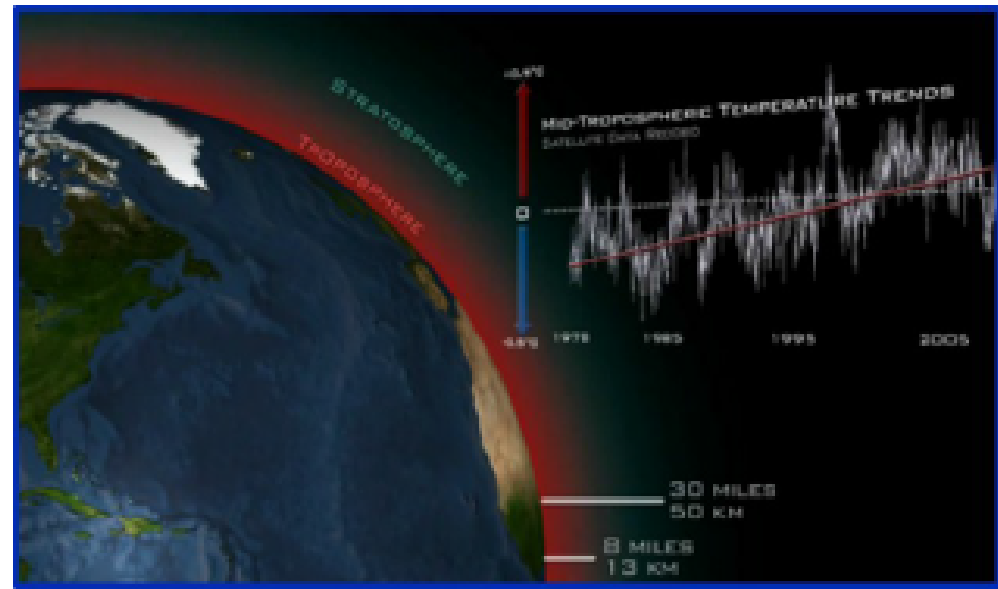
## PENTAGON: CLIMATE CHANGE IS A MISSION REALITY, NOT POLITICAL DEBATE

Mark Fraser—Public Policy Officer

The subject of global warming has been discussed academically since the mid 80's, when I was working on high-altitude nuclear effects and took a few graduate-level courses on atmospheric science. I remember attending defense conferences in the early 90's where DoD officials (Lt Col Swenson, SDIO) expressed concerns about the potential impact of global warming on national defense. In fact, the effects of man-made emissions were included in an atmospheric code I used (SHARC), and I discovered a special case where a specific defense scenario was significantly affected. Recently, [Pentagon spokesman Mark Wright said](#), "For DoD, this is a mission reality, not a political debate. We're taking sensible measured steps to mitigate the mission risk posed by climate change."

In the past few months there have been several significant climate assessment reports that have been released. In March 2014 the U.S. Department of Defense released its [2014 Quadrennial Defense Review](#). "The QDR robustly addresses the national security implications of climate change – [highlighting the significant degree](#) to which the climate change threat is taken seriously by the U.S. military."

The United Nations Intergovernmental Panel on Climate Change (IPCC) released its *Fifth Assessment Report* in three sections in Sept 2013, March 2014, and April 2014, by Working Groups I, II, and III respectively. The IPCC provides an internationally accepted authority on climate change, releasing reports compiled by thousands of scientists from over 120 countries. The 5<sup>th</sup> report confirms that "that human influence was the dominant cause of global warming between 1951-2010."





In May 2014, the [U.S. Global Change Research Program](#) released the [Third National Climate Assessment](#). "By far the most comprehensive look ever at climate change impacts in the United States. Based on four years of work by hundreds of experts from government, academia, corporations, and public-interest organizations, the Assessment confirms abundant data and examples that climate change isn't some distant threat -- it's affecting us now."

As Public Policy Officer, one of the key issues that the American Institute of Aeronautics and Astronautics has suggested in the past that we bring to the US Congress on our annual visits to DC is that of [environmental monitoring and climate change](#). The AIAA accepts the conclusions of the Intergovernmental Panel on Climate Change (IPCC) and would like Congress to fund NASA and NOAA to establish a more comprehensive monitoring system.

It is the AIAA's view that "Significant global changes in climate patterns in recent decades are evident, appearing both as gradual and abrupt phenomena. Accumulating 'greenhouse gases', including from human activity are likely contributors to these changes. Since natural effects couple with the human-induced effects through intertwined feedback mechanisms, an understanding of the dynamics of Global Climate Change (GCC) requires an extensive, global observation program." The AIAA sites various examples and concludes that, "All these circumstances are likely indicators of GCC, with a probable major contribution from the human driven emissions." (CONTINUED next page)

Here are two AIAA information papers:

[Advancing and Applying Aerospace Technology to Protect the Global Environment](#)

[Essential Capabilities for Operational Climate Change Monitoring](#)

It is 2014 and there are still some elected representatives who actively deny scientific facts and who even try to prevent research and education, specifically concerning global warming and evolution. Yet, species evolve, the Earth is warming due to us, the Earth is spherical and orbits the Sun, and we did land on the Moon. As Neil deGrasse Tyson says, "The good thing about science is that it's true whether or not you believe in it."

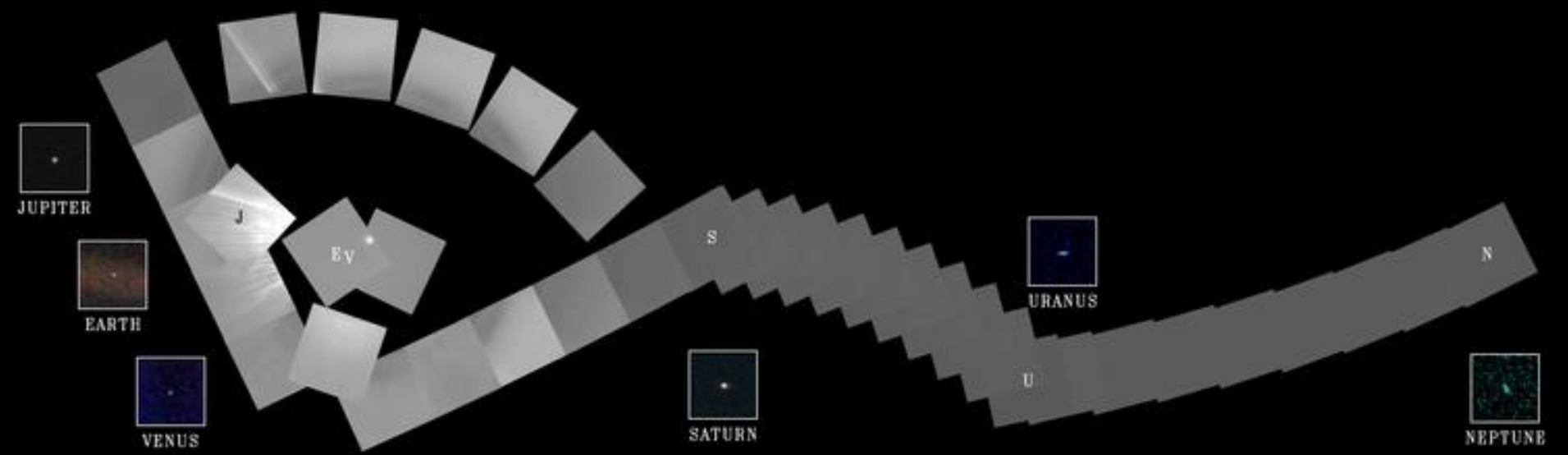
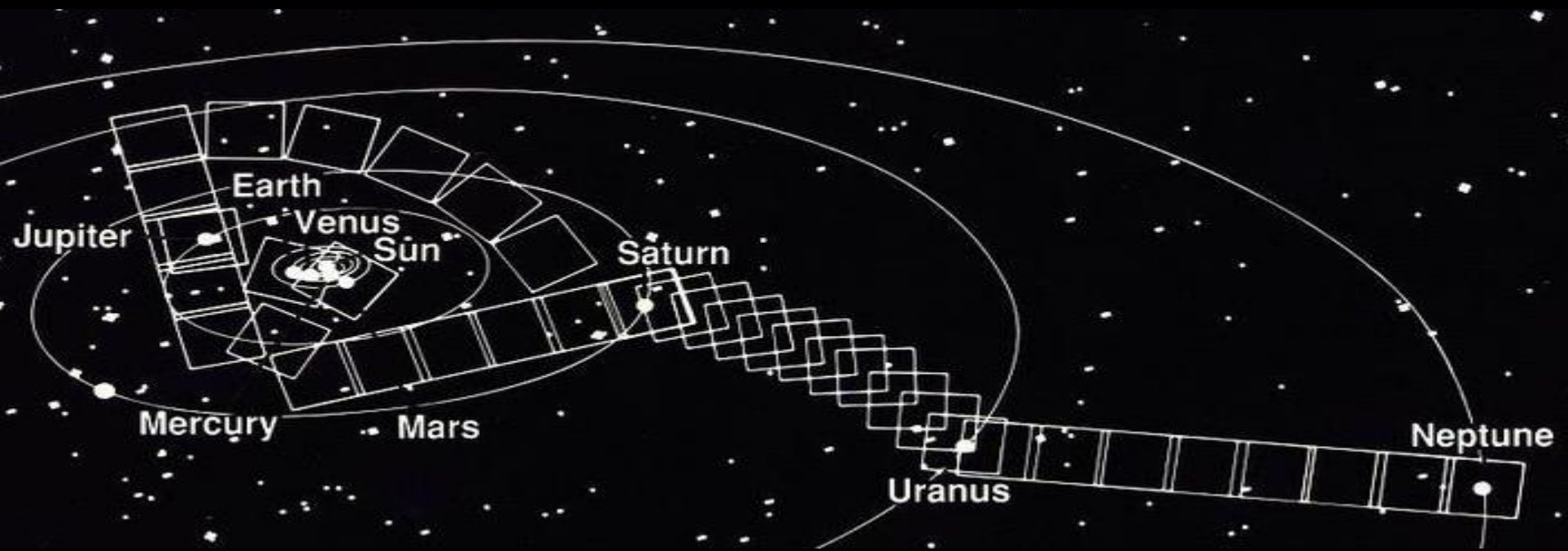
By the way, an excellent resource for science education, specifically concerning climate change and evolution, is the [National Center for Science Education \(NCSE\)](#).

Also, [RealClimate](#) is a commentary site by working climate scientists for the general public and journalists.

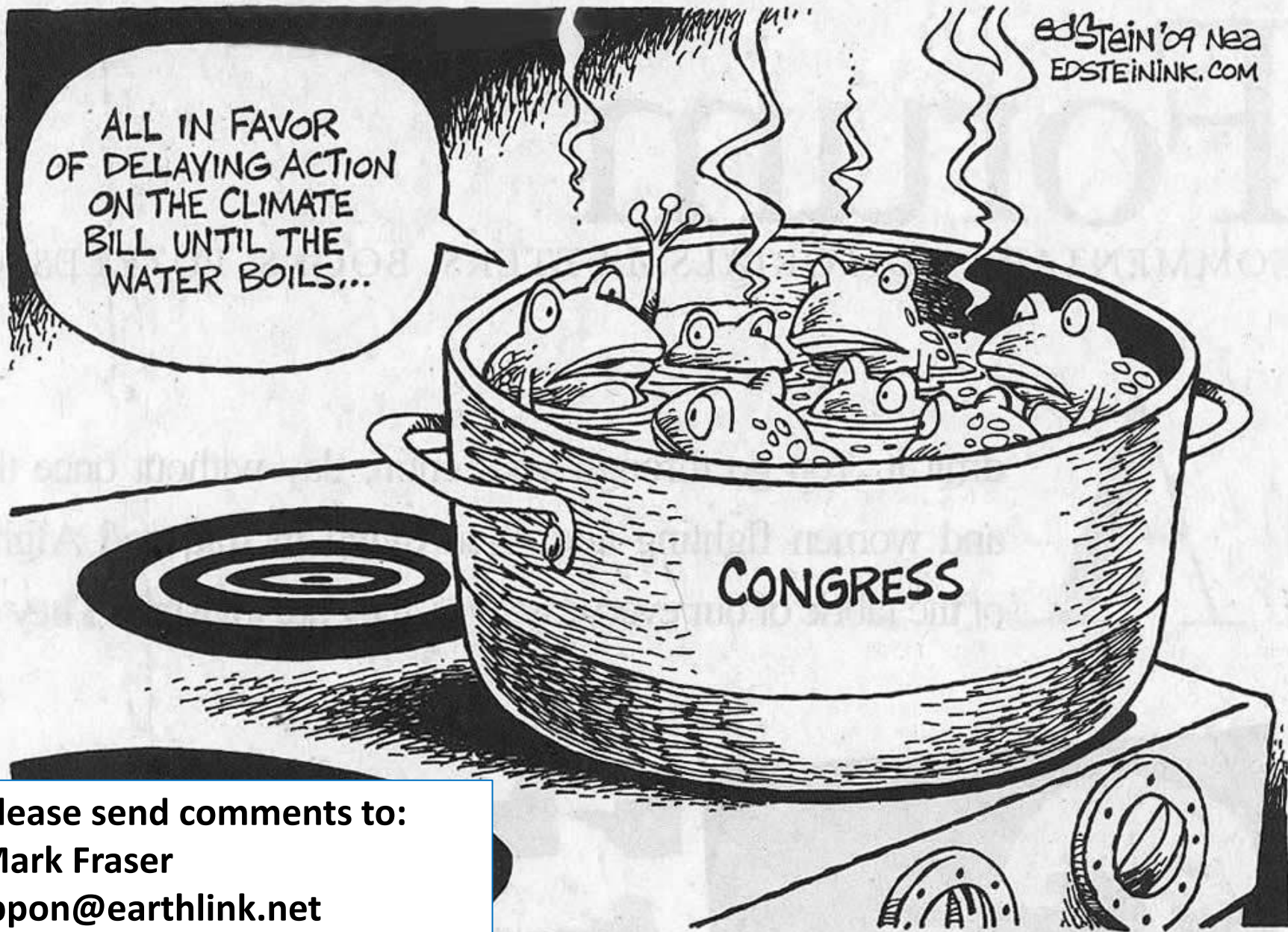
The data collected by climate scientists show that global temperatures and sea levels, and the frequency and intensity of extreme weather events are increasing faster than what was predicted years ago, and that human influence is the dominant factor above all known natural causes. The defense and intelligence communities understand this and are exploring the consequences to our national security. As Richard Feynman famously said in his conclusion to his report on the space shuttle Challenger accident, "Reality must take precedence over public relations, for Nature cannot be fooled."

On February 14, 1990, Voyager 1 took the first ever "family portrait" of our Solar System as seen from outside (6 billion km), which includes the famous image known as "Pale Blue Dot".

[https://en.wikipedia.org/wiki/Family\\_Portrait\\_\(Voyager\)](https://en.wikipedia.org/wiki/Family_Portrait_(Voyager))







Please send comments to:  
Mark Fraser  
ippon@earthlink.net