



# A Presentation Of

# **The North Texas Skeptics**

Working to help people avoid dumb ass mistakes since 1987

[www.ntskeptics.org](http://www.ntskeptics.org)

P.O. Box 111794

Carrollton, TX 75011-1794



# The NTS Presents

# Anthropogenic Global Warming (AGW)

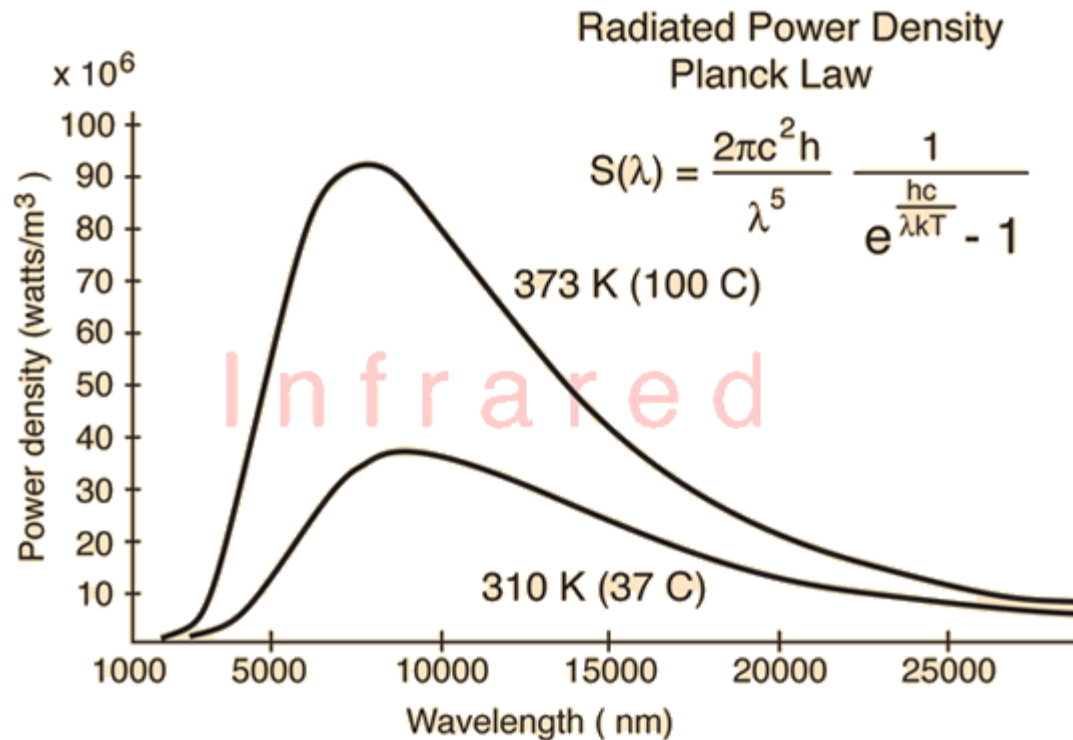


# AGW Basics

- **Earth maintains a temperature balance due to a number of factors.**
- **Solar energy flux (in)**
- **Nuclear decay (in)**
- **Tidal dissipation (in)**
- **Reflective radiation (out)**
- **Thermal radiation (out)**



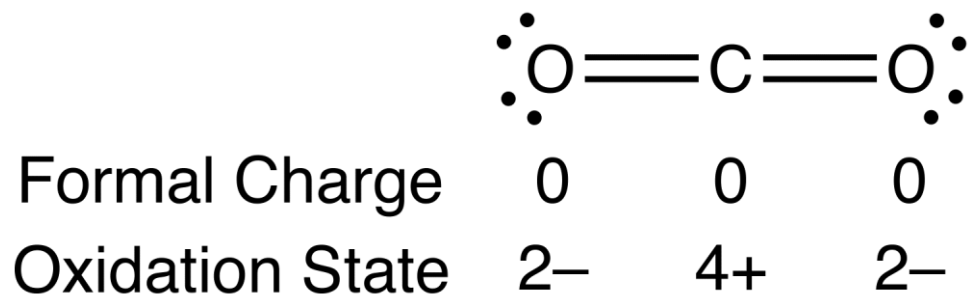
# Black Body Equilibrium





# The Physics

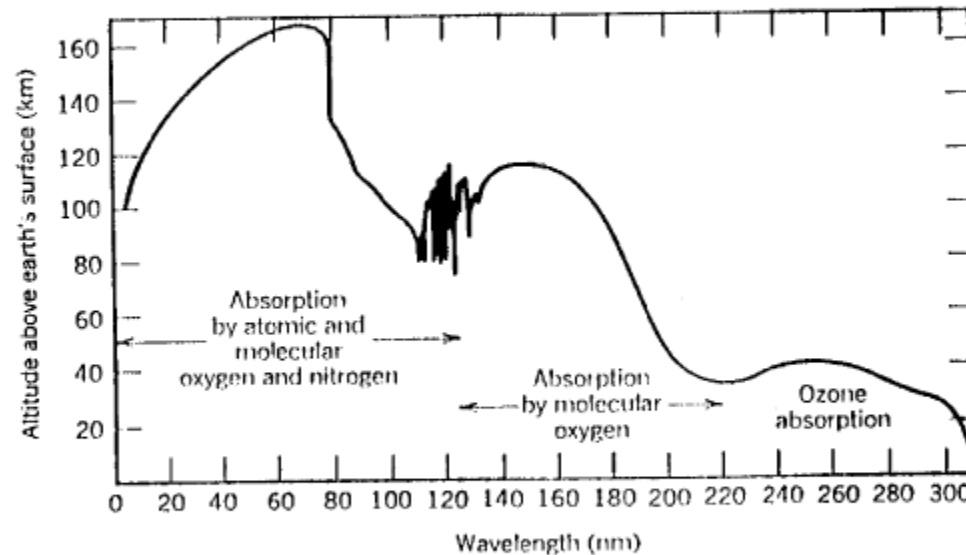
The carbon dioxide molecule is linear and centrosymmetric. The two C=O bonds are equivalent and are short (116.3 pm), consistent with double bonding. Since it is centrosymmetric, the molecule has no electrical dipole. Consistent with this fact, only two vibrational bands are observed in the IR spectrum – an antisymmetric stretching mode at  $2349\text{ cm}^{-1}$  and a bending mode near  $666\text{ cm}^{-1}$ . There is also a symmetric stretching mode at  $1388\text{ cm}^{-1}$  which is only observed in the Raman spectrum.





# The Physics

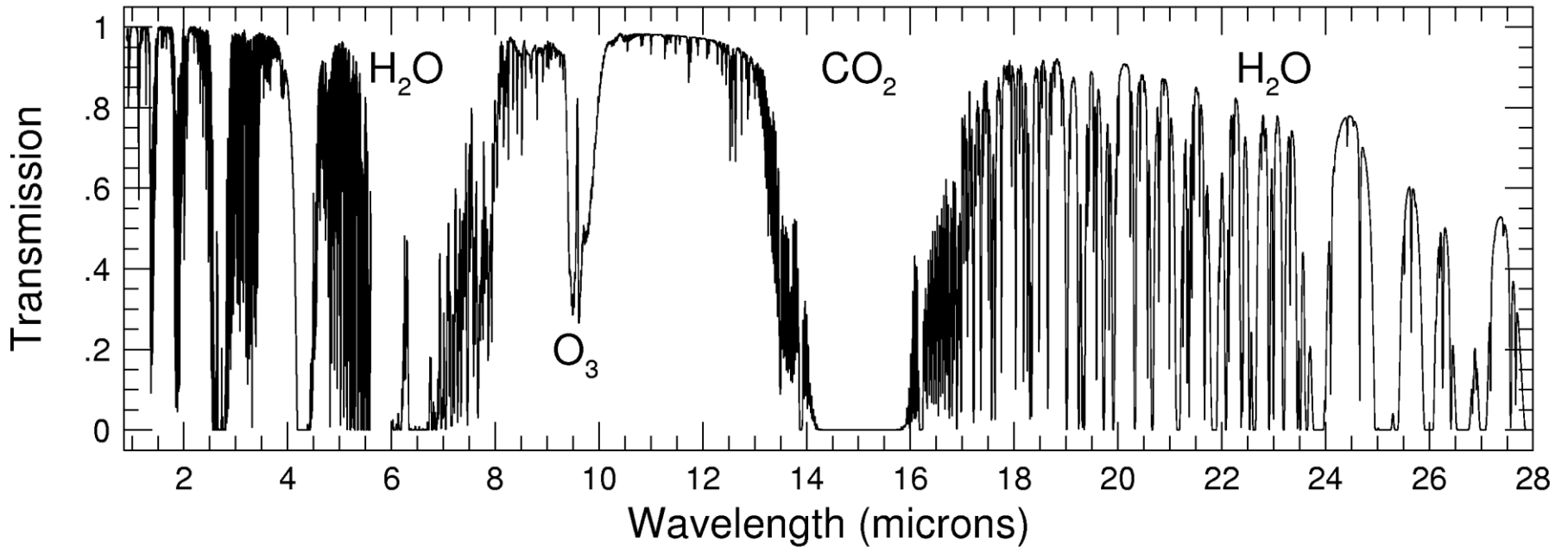
## Regions of Light Absorption of Solar Radiation



**FIGURE 3.2.** Approximate regions of maximum light absorption of solar radiation in the atmosphere by various atomic and molecular species as a function of altitude and wavelength with the sun overhead (from H. Friedman, in *Physics of the Upper Atmosphere*, J. A. Ratcliffe, Ed., Academic Press, New York, 1960).

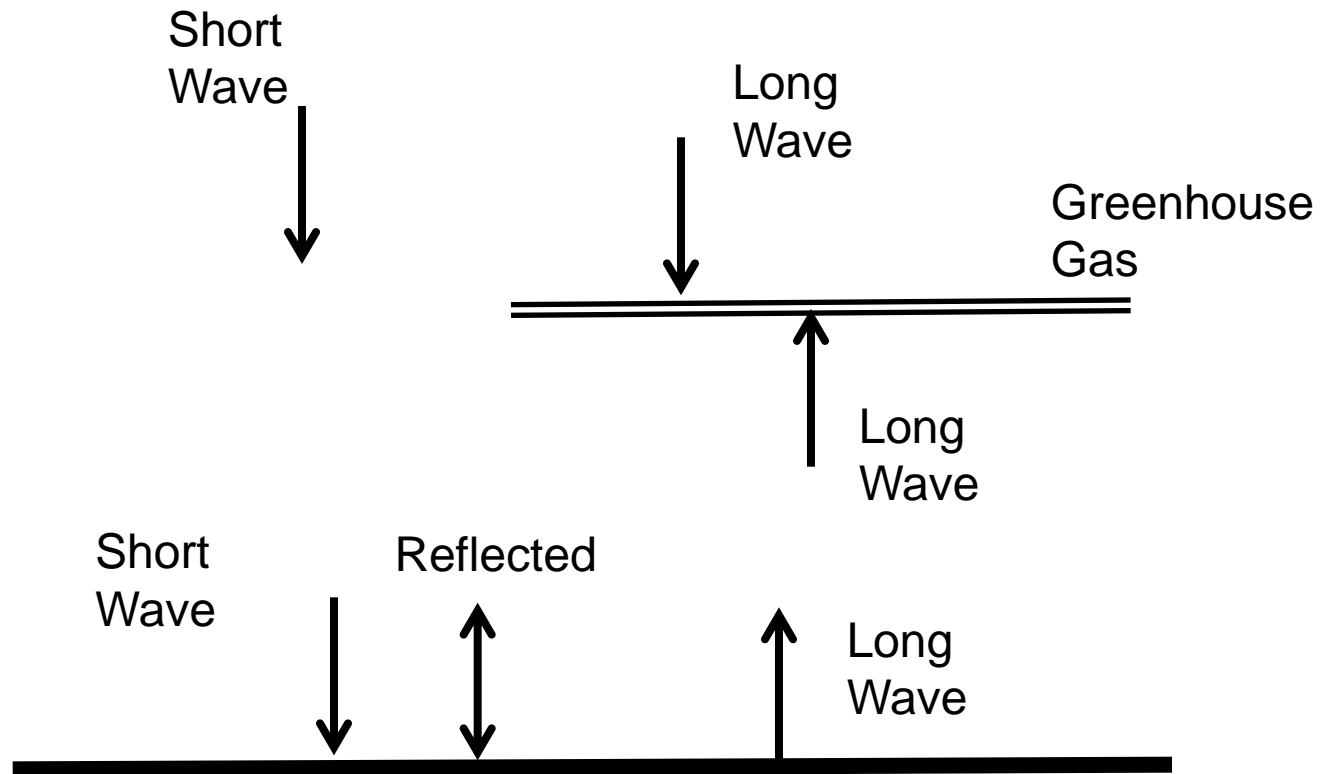


# The Physics





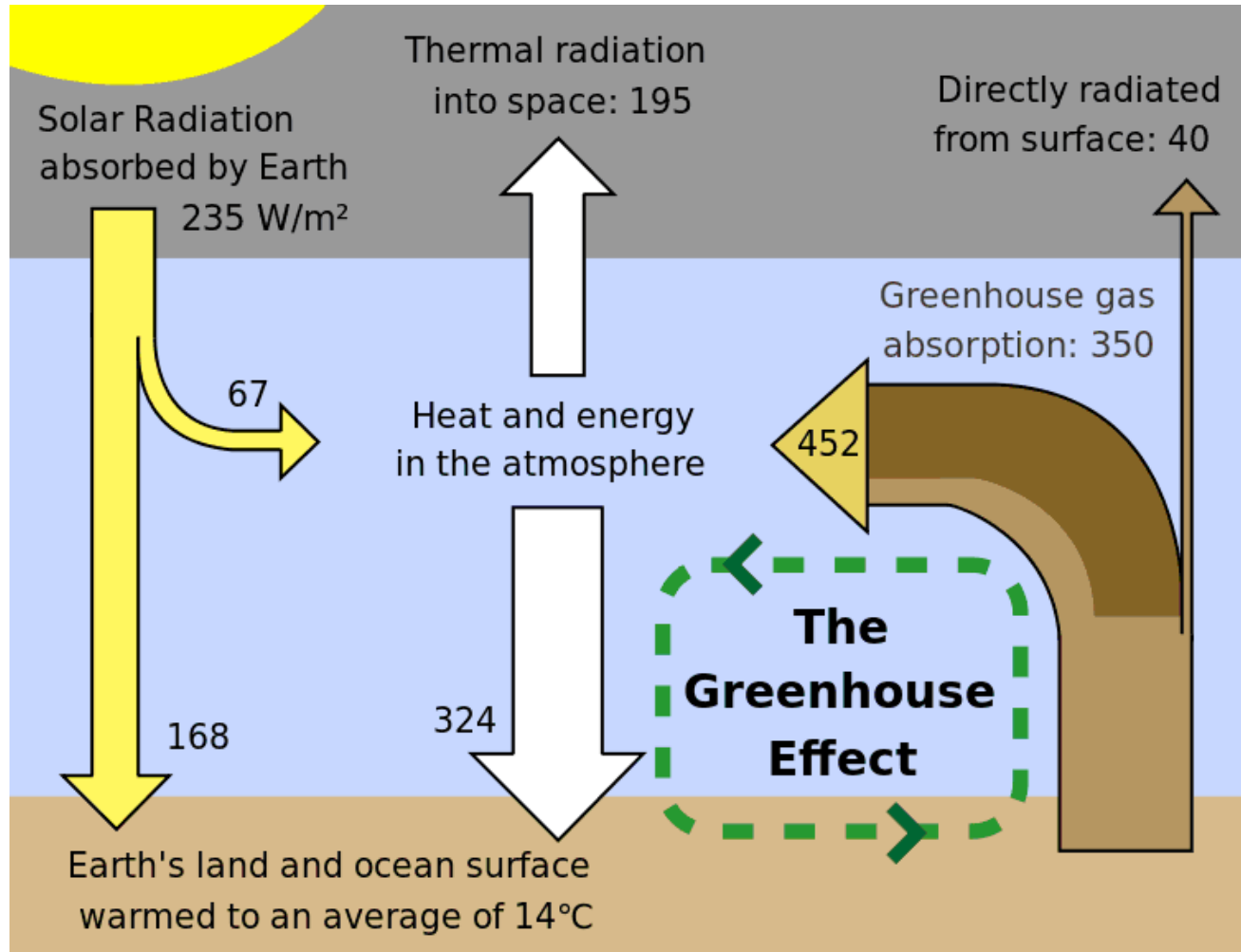
# Greenhouse Effect







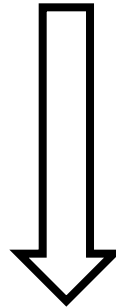
# The Greenhouse Effect





# Greenhouse Effect

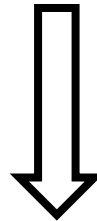
Absorbed radiation from  
the sun:  $235 \text{ W/m}^2$



67 absorbed by  
the atmosphere



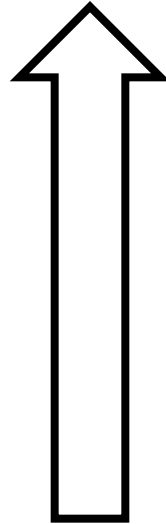
168 absorbed by  
the surface





# Greenhouse Effect

195 radiated from the atmosphere into space



40 radiated from the surface into space



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Total 235 radiated into space

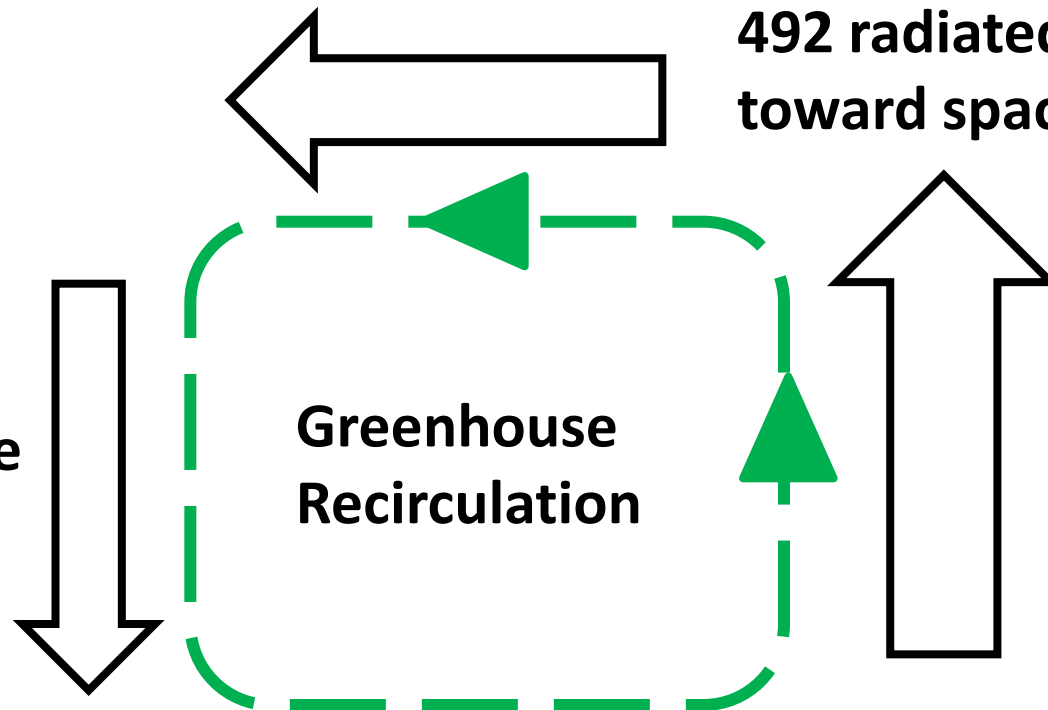


# Greenhouse Effect

452 total absorbed  
by the atmosphere

492 radiated  
toward space

324 total  
absorbed by the  
surface





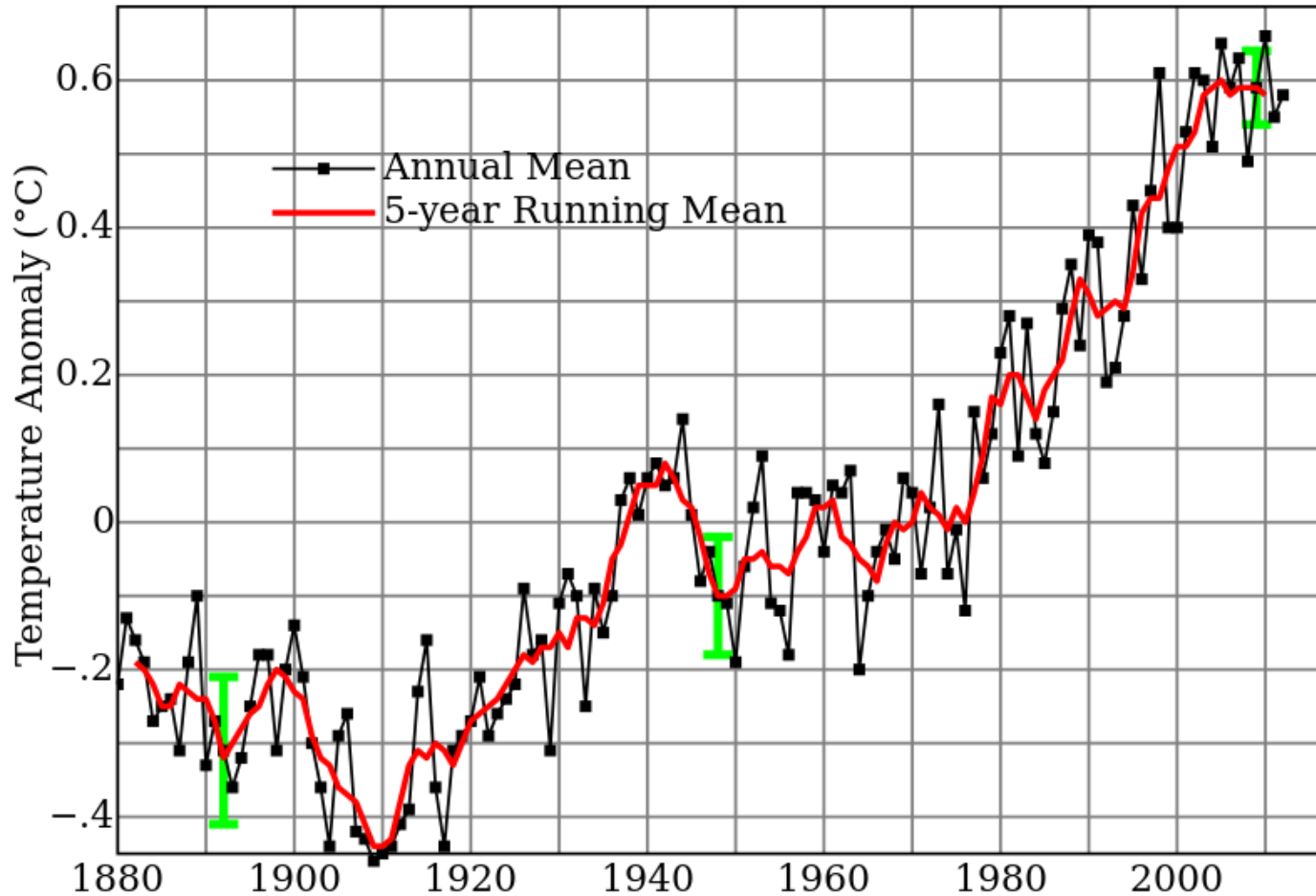
# Thermal Balance Factors

- **Solar flux varies over million-year cycles.**
- **Nuclear decay declines exponentially.**
- **Tidal dissipation declines.**
- **Reflective and radiated losses are affected by atmospheric absorption and can be impacted by human activity.**



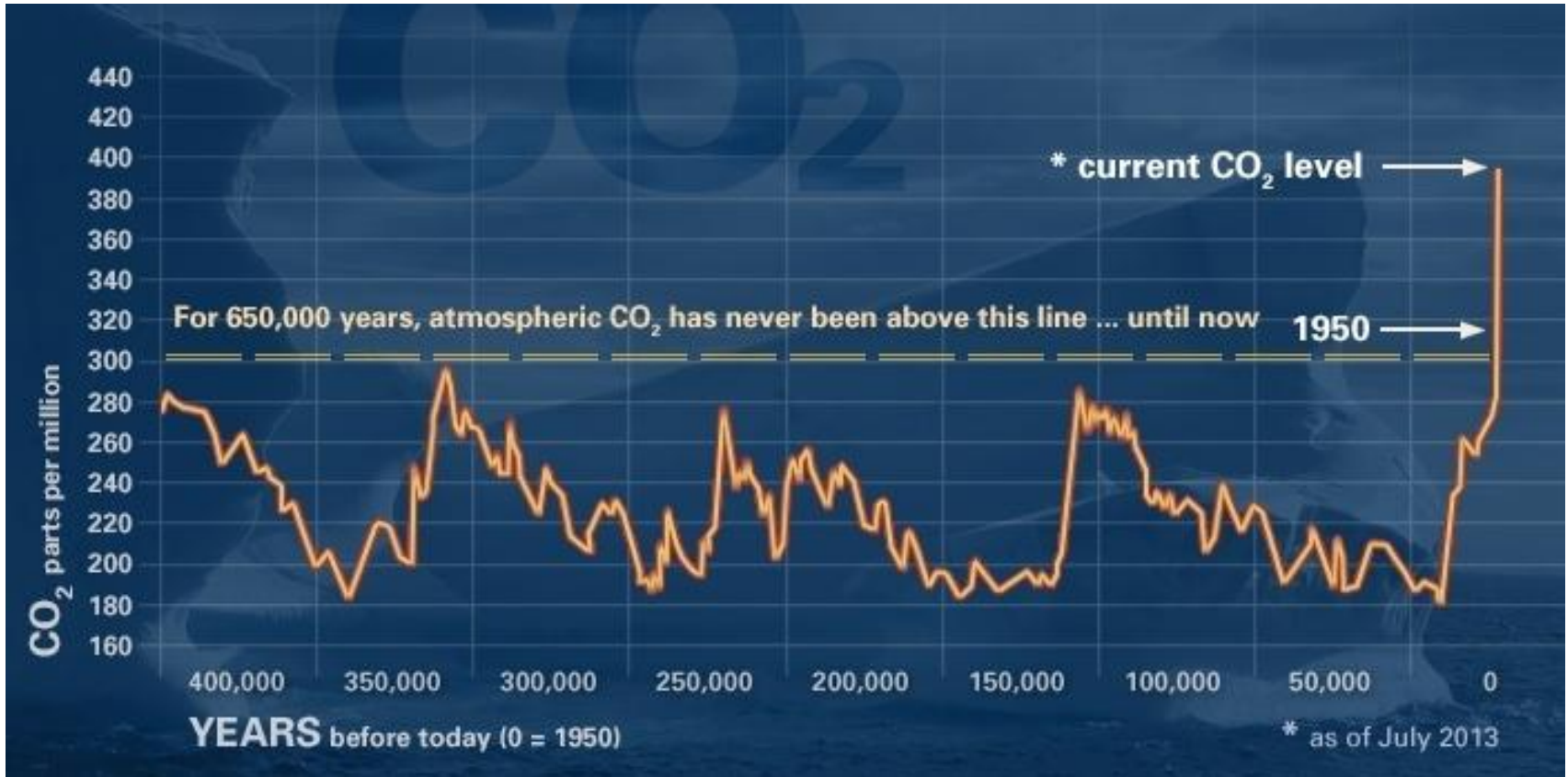
# The Evidence

Global Land-Ocean Temperature Index



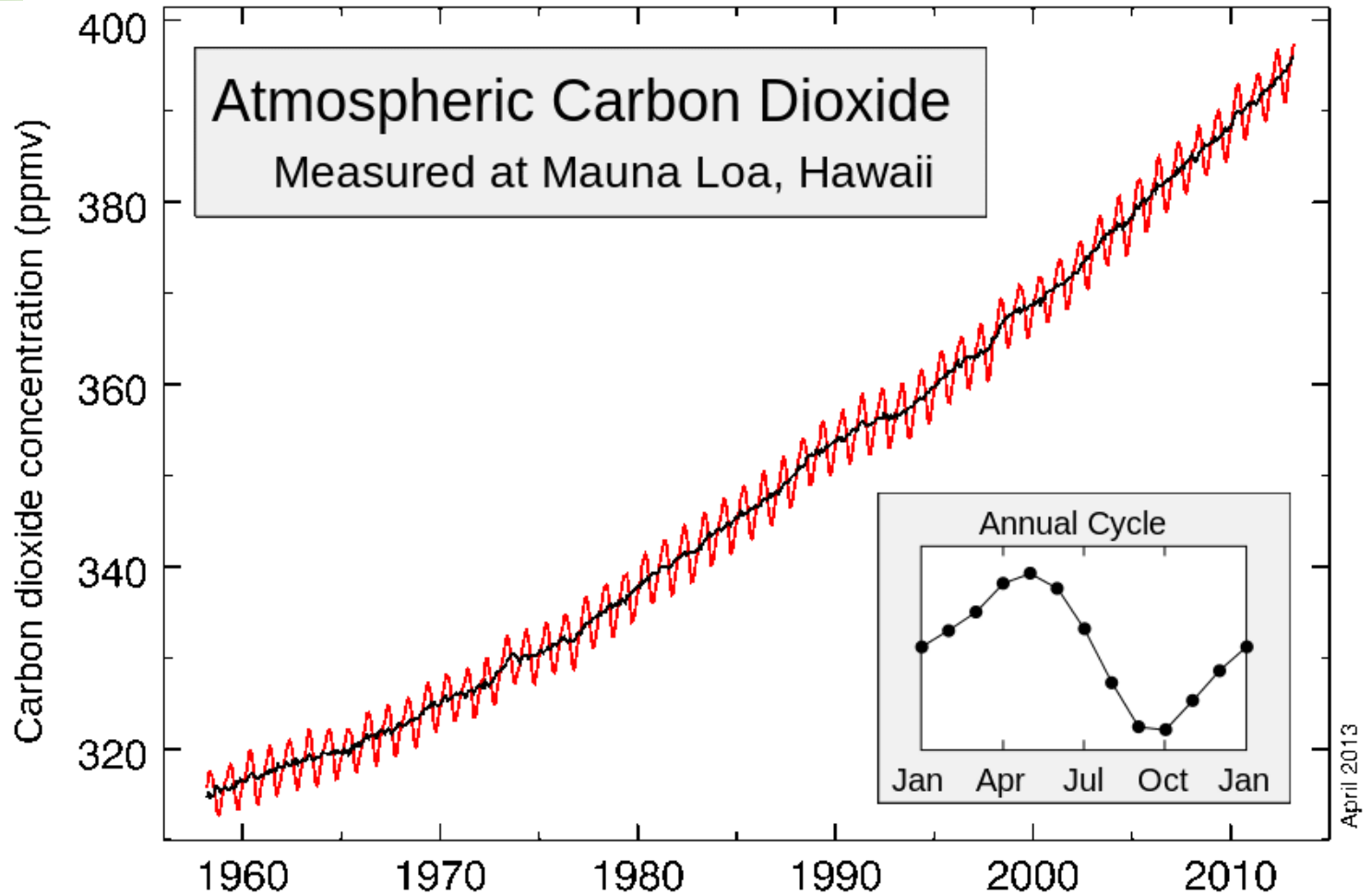


# Evidence Of Warming





# Carbon Dioxide History







# The Bad News

- **Human activity supplements long-term changes in biosphere (air, water) temperatures.**
- **AGW produces temperature rises much more rapidly than would ordinarily occur.**
- **The Earth biosphere will not well tolerate a rapid rise in temperature.**



# The Really Bad News

- **AGW can produce 3 C rise this century.**
- **Warming oceans will expand, raising sea level 3 feet.**
- **Melting land ice can raise sea level tens of feet.**
- **Regional climate changes (warmer, cooler, wetter, dryer) can disrupt economies**



# Worst Case

- **Warmer temperatures → less snow**
- **Less snow → less reflection**
- **Less reflection → warmer temperatures**
- **Repeat (positive feedback—runaway warming)**
- **Can result in catastrophic melting of polar ice**



# Atmospheric Facts

- Atmosphere weighs at most  $5.665 \times 10^{15}$  tons.
- Atmosphere is presently 0.0004 CO<sub>2</sub> by volume.
- 3348 billion tons of CO<sub>2</sub> in the atmosphere.
- One ton of carbon (coal) → 3.67 tons CO<sub>2</sub>
- One ton petroleum → 3.32 tons CO<sub>2</sub>
- 0.221 tons per automobile per year



# Greenhouse Gases

- **Water**
- **Carbon dioxide**
- **Methane**
- **Absorb long-wave infra red radiation**
- **Earth would be 33 C cooler without greenhouse gases.**



# Greenhouse Gases

Compound	Formula	Contribution (%)
Water vapor and clouds	H <sub>2</sub> O	36–72%
Carbon dioxide	CO <sub>2</sub>	9–26%
Methane	CH <sub>4</sub>	4–9%
Ozone	O <sub>3</sub>	3–7%



# Concentration

Gas	Pre-1750 tropospheric concentration <sup>[43]</sup>	Recent tropospheric concentration <sup>[44]</sup>	Absolute increase since 1750	Percentage increase since 1750	Increased radiative forcing (W/m <sup>2</sup> ) <sup>[45]</sup>
Carbon dioxide (CO <sub>2</sub> )	280 ppm <sup>[46]</sup>	395.4 ppm <sup>[47]</sup>	115.4 ppm	41.2%	1.88
Methane (CH <sub>4</sub> )	700 ppb <sup>[48]</sup>	1893 ppb / <sup>[49]</sup> 1762 ppb <sup>[49]</sup>	1193 ppb / 1062 ppb	170.4% / 151.7%	0.49
Nitrous oxide (N <sub>2</sub> O)	270 ppb <sup>[45][50]</sup>	326 ppb / <sup>[49]</sup> 324 ppb <sup>[49]</sup>	56 ppb / 54 ppb	20.7% / 20.0%	0.17
Tropospheric ozone (O <sub>3</sub> )	237 ppb <sup>[43]</sup>	337 ppb <sup>[43]</sup>	100 ppb	42%	0.4 <sup>[51]</sup>



# Life Of Greenhouse Gases

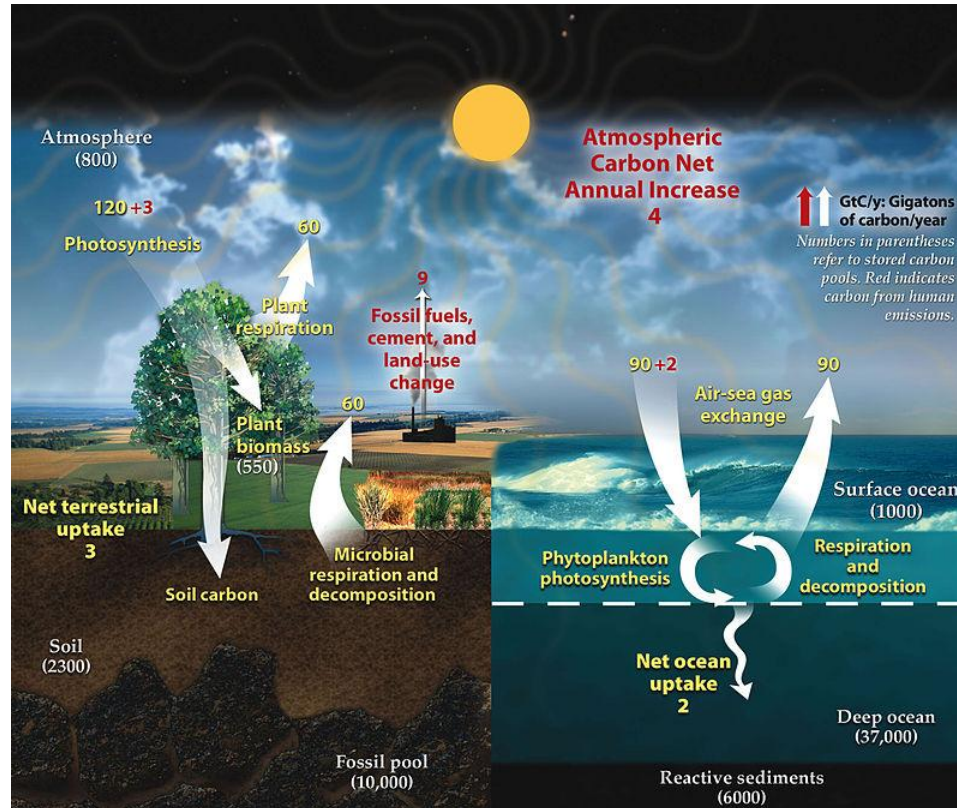
Atmospheric lifetime and **GWP** relative to CO<sub>2</sub> at different time horizon for various greenhouse gases.

Gas name	Chemical formula	Lifetime (years)	Global warming potential (GWP) for given time horizon		
			20-yr	100-yr	500-yr
<b>Carbon dioxide</b>	CO <sub>2</sub>	See above	1	1	1
<b>Methane</b>	CH <sub>4</sub>	12	72	25	7.6
<b>Nitrous oxide</b>	N <sub>2</sub> O	114	289	298	153
<b>CFC-12</b>	CCl <sub>2</sub> F <sub>2</sub>	100	11 000	10 900	5 200
<b>HCFC-22</b>	CHClF <sub>2</sub>	12	5 160	1 810	549
<b>Tetrafluoromethane</b>	CF <sub>4</sub>	50 000	5 210	7 390	11 200
<b>Hexafluoroethane</b>	C <sub>2</sub> F <sub>6</sub>	10 000	8 630	12 200	18 200
<b>Sulfur hexafluoride</b>	SF <sub>6</sub>	3 200	16 300	22 800	32 600
<b>Nitrogen trifluoride</b>	NF <sub>3</sub>	740	12 300	17 200	20 700





# Carbon Cycle

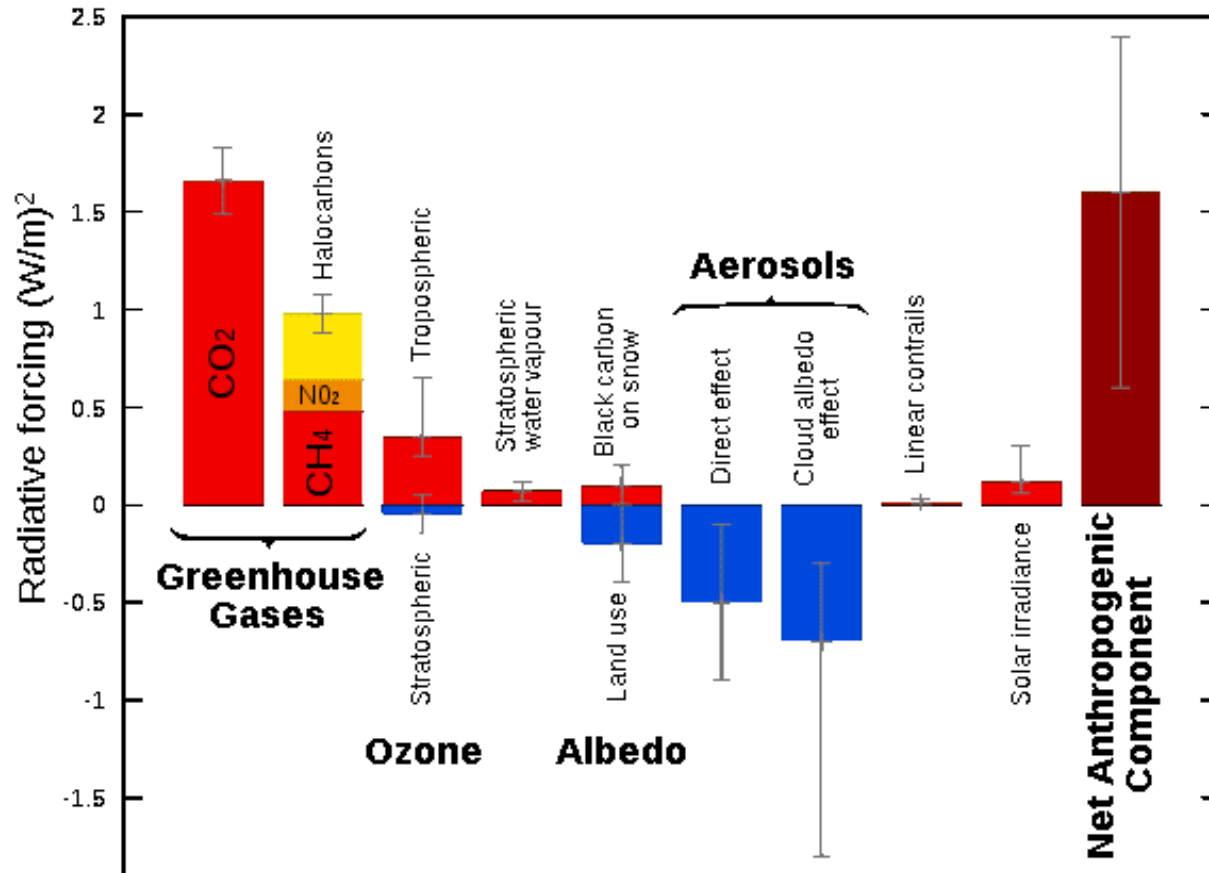


This diagram of the fast carbon cycle shows the movement of carbon between land, atmosphere, and oceans in billions of tons of carbon per year. Yellow numbers are natural fluxes, red are human contributions in billions of tons of carbon per year. White numbers indicate stored carbon.



# Relative Forcing

## Radiative Forcing Components





# Human Contribution

Human activity since the [Industrial Revolution](#) has increased the amount of greenhouse gases in the atmosphere, leading to increased radiative forcing from CO<sub>2</sub>, methane, [tropospheric ozone](#), [CFCs](#) and [nitrous oxide](#). According to work published in 2007, the [concentrations](#) of CO<sub>2</sub> and methane have increased by 36% and 148% respectively since 1750. These levels are much higher than at any time during the last 800,000 years, the period for which reliable data has been extracted from [ice cores](#). Less direct geological evidence indicates that CO<sub>2</sub> values higher than this were last seen about 20 million years ago. [Fossil fuel](#) burning has produced about three-quarters of the increase in CO<sub>2</sub> from human activity over the past 20 years. The rest of this increase is caused mostly by changes in land-use, particularly [deforestation](#). Estimates of global CO<sub>2</sub> emissions in 2011 from fossil fuel combustion, including cement production and gas flaring, was 34.8 billion tonnes (9.5 ± 0.5 PgC), an increase of 54% above emissions in 1990. Coal burning was responsible for 43% of the total emissions, oil 34%, gas 18%, cement 4.9% and gas flaring 0.7% In May 2013, it was reported that readings for CO<sub>2</sub> taken at the world's primary benchmark site in [Mauna Loa](#) surpassed 400 [ppm](#). According to professor [Brian Hoskins](#), this is likely the first time CO<sub>2</sub> levels have been this high for about 4.5 million years.

[Source: [http://en.wikipedia.org/wiki/Global\\_warming](http://en.wikipedia.org/wiki/Global_warming)]



# Consequences

- **Sea level rise is the worst. A rise of just a few feet will encroach on countries like Bangladesh and the Maldives. The Mississippi Delta is at sea level. New York City and Washington D.C are just above.**
- **Effects on crops**
- **More energy in the air → stormy weather**
- **Less rain | more rain?**



# The Opposition

- **Heartland Institute**
- **American Legislative Exchange Council**
- **Petroleum industry**
- **Coal industry**
- **Various political fuddy-duddies**
- **Glenn Beck**
- **Senator James Inhofe**



# **Paid Climate Deniers**

## **Wei-Hock (Willie) Soon**

**But newly released documents show the extent to which Dr. Soon's work has been tied to funding he received from corporate interests.**

**He has accepted more than \$1.2 million in money from the fossil-fuel industry over the last decade while failing to disclose that conflict of interest in most of his scientific papers. At least 11 papers he has published since 2008 omitted such a disclosure, and in at least eight of those cases, he appears to have violated ethical guidelines of the journals that published his work.**

**The documents show that Dr. Soon, in correspondence with his corporate funders, described many of his scientific papers as "deliverables" that he completed in exchange for their money. He used the same term to describe testimony he prepared for Congress.**



# The Real Villains

- **Not the oil companies**
- **Not the coal companies**
- **The real villains are us (we).**
- **If we stopped purchasing these products the companies would stop drilling and mining.**



# The Solution

- **Stop using fossil fuel.**
- **Cannot stop pumping oil.**
- **If the oil pumps stopped today, within a year in the order of 1 billion people would starve to death.**
- **There is no hybrid jet liner.**
- **Produce carbon-based fuel from atmospheric CO<sub>2</sub>.**





# Bad Solutions

- **Ethanol**
  - Not carbon neutral
  - Competes for vital resources
- **Hydro power**
  - Limited resource
  - Does not scale well
  - Ecological and geological disruption



# Good Solutions

- **Solar power**
  - 1000 Watts per square meter
  - Only works when the sun shines
  - Becoming competitive
- **Wind power**
  - Only works when the wind blows
  - Currently competitive
- **Nuclear power (hydrogen?)**
  - No hydrogen solution in sight
  - Finite uranium source



# A Basic Fact

**Human well being, health, longevity, satisfaction of life—all are proportional to individual energy consumption.**



# The Hydrocarbon Solution

- **Hydrocarbons are the ideal energy storage medium.**
- **Ethanol is not a hydrocarbon.**
- **Source from natural vegetation**
- **Source from atmospheric CO<sub>2</sub>**
- **Low down-channel impact**
- **Technology is lacking.**



# Fuel From Plants

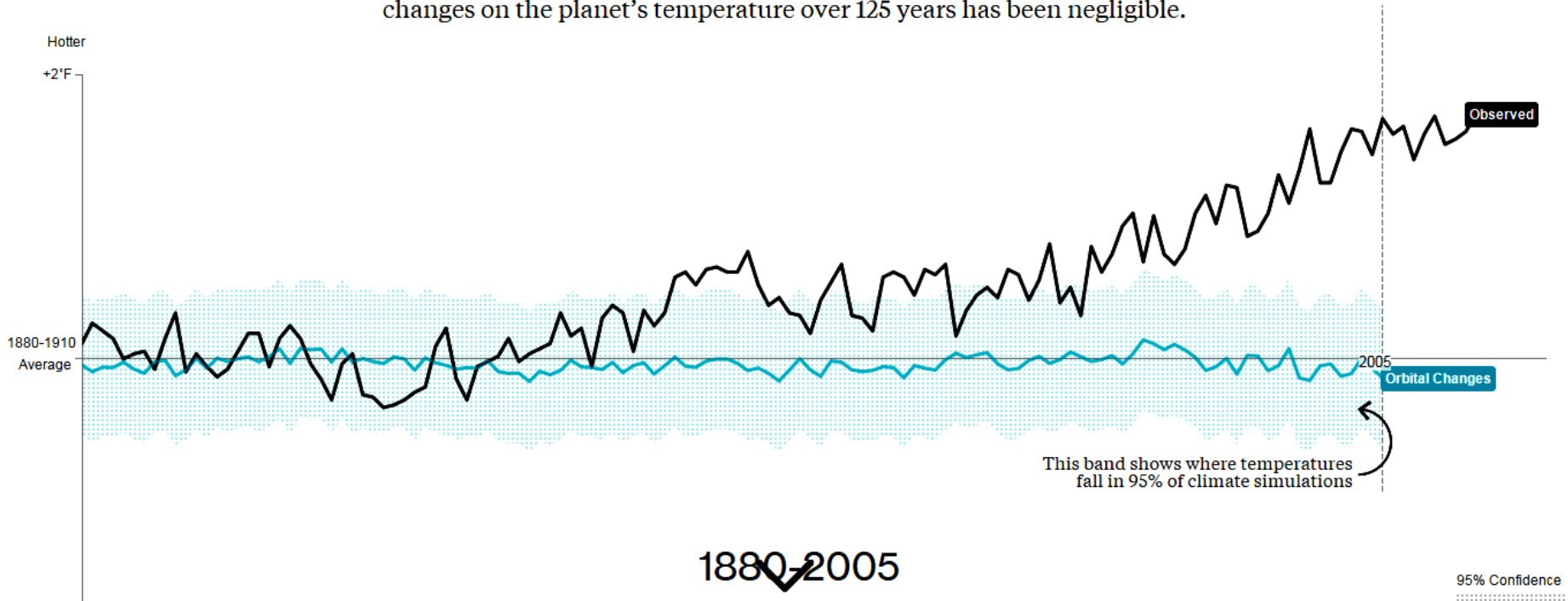
- **Plants are harvested for the carbon.**
- **Removing the plants also removes plant nutrients from the growing area.**
- **For sustainable production the nutrients need to be returned to the growing area.**



# Correlation

## Is It the Earth's Orbit?

The Earth wobbles on its axis, and its tilt and orbit change over many thousands of years, pushing the climate into and out of ice ages. Yet the influence of orbital changes on the planet's temperature over 125 years has been negligible.



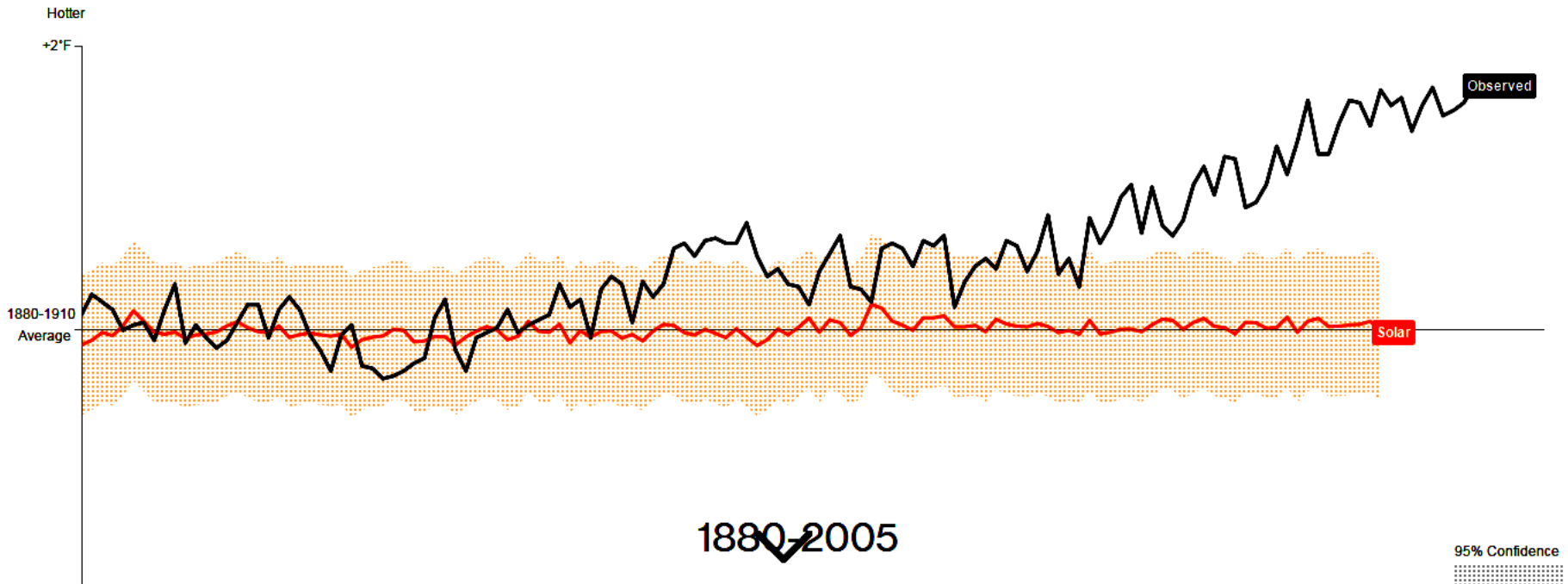
<http://www.bloomberg.com/graphics/2015-whats-warming-the-world/>



# Correlation

## Is It the Sun?

The sun's temperature varies over decades and centuries. These changes have had little effect on the Earth's overall climate.



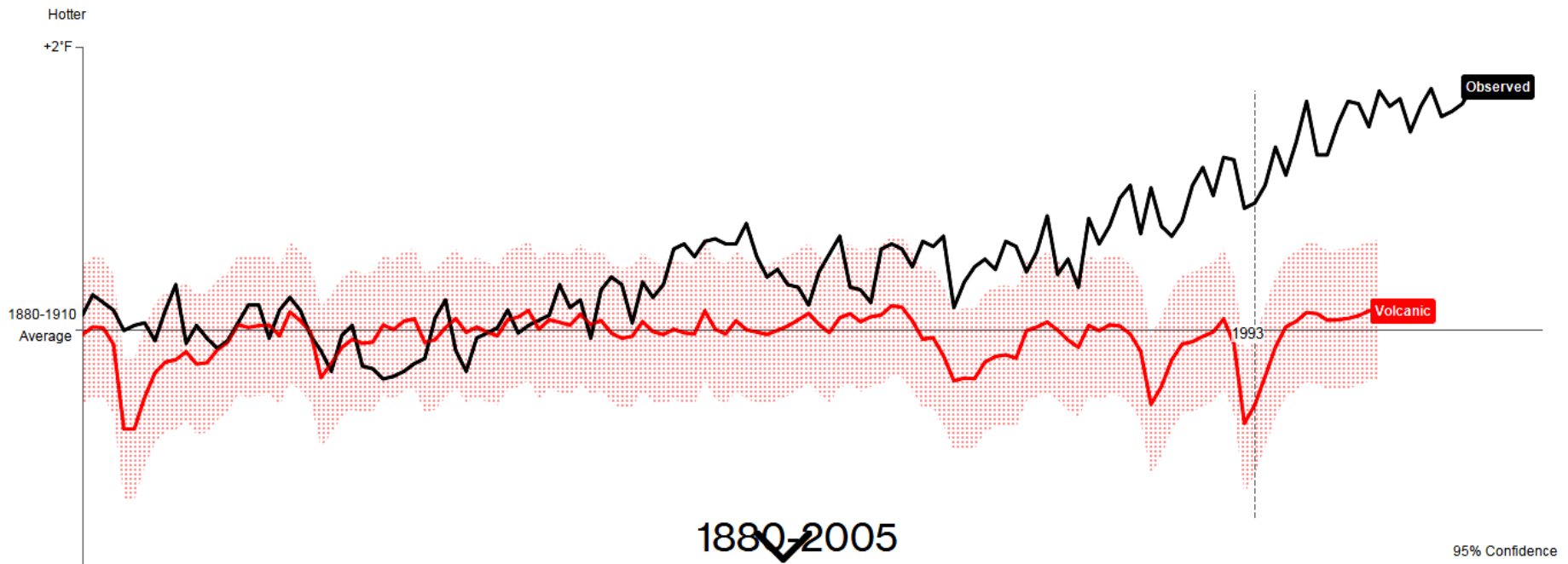
<http://www.bloomberg.com/graphics/2015-whats-warming-the-world/>



# Correlation

## Is It Volcanoes?

The data suggest no. Human industry emits about 100 times more CO<sub>2</sub> than volcanic activity, and eruptions release sulfate chemicals that can actually cool the atmosphere for a year or two.



<http://www.bloomberg.com/graphics/2015-whats-warming-the-world/>





# Responses

## **Germany Now Produces Half Of Its Energy Using Solar**

**June 24, 2014 | by Stephen Luntz**

**Germany has set a new record, with solar power providing 50.6% of its electricity in the middle of the day on Monday June 9th.**

**Solar production peaked that day at 23.1GW. Three days earlier it was 24.2GW between 1 and 2pm, but on the 9th demand was down for a public holiday, allowing the breaking of the psychological 50% barrier.**

**<http://www.iflscience.com/technology/germany-now-produces-half-its-energy-using-solar>**



# Responses

## **John Kasich: “We Shouldn’t Try To Fix Climate Change Because That’s The Creator’s Wish”**

**John Kasich, the Republican governor of Ohio, announced his bid for the presidency Tuesday. Unlike most of his GOP opponents, Kasich actually believes that climate change is real. “I happen to believe there is a problem with climate change,” he told the Hill 2012. “I don’t want to overreact to it, I can’t measure it all, but I respect the creation that the Lord has given us and I want to make sure we protect it.” He made a similar statement at a conference last month, but he added that the environment shouldn’t be “worshipped,” because that would be “pantheism.”**

<http://dcpols.com/john-kasich-we-shouldnt-try-to-fix-climate-change-because-thats-the-creators-wish/>



# Responses

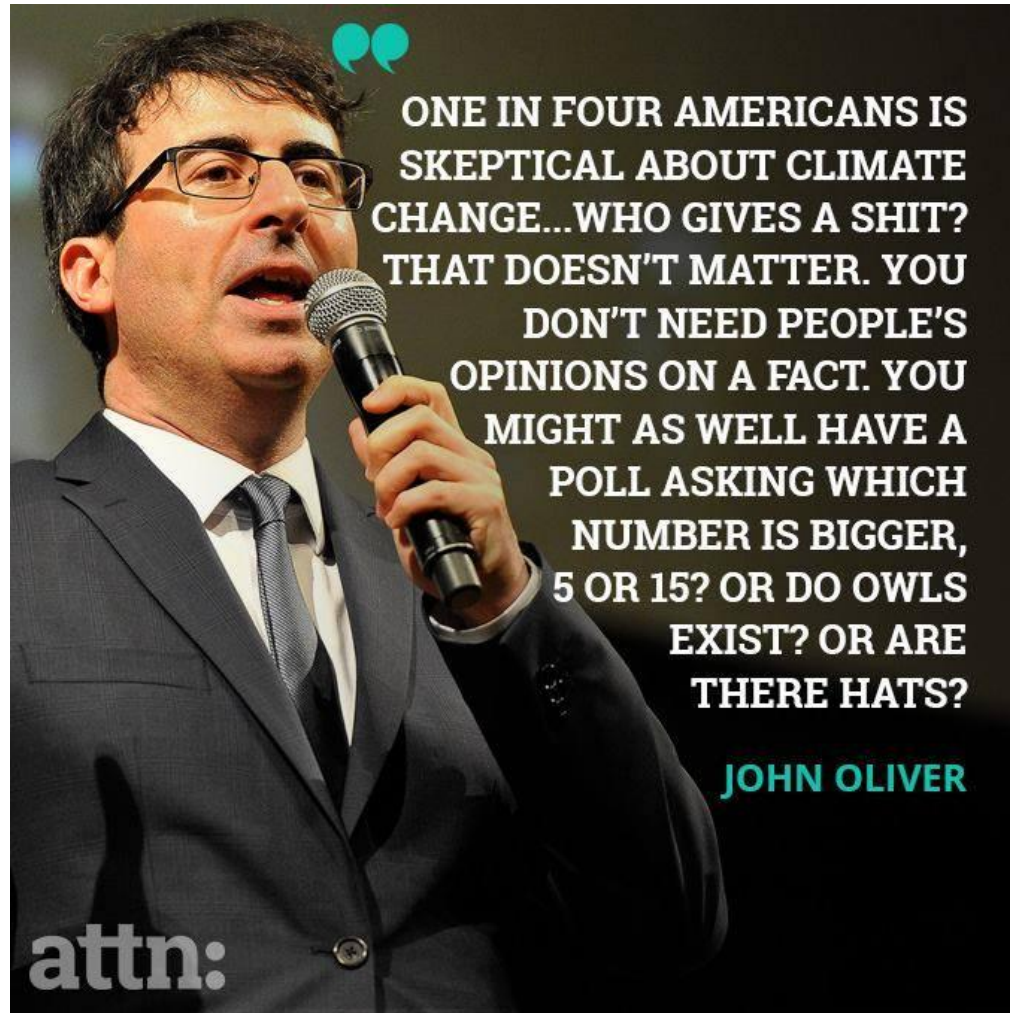
## Florida Makes Off-Grid Living Illegal – Mandates All Homes Must Be Connected To Electricity & Water Grid

Robin Speronis lives off the grid in Florida, completely independent of the city's water and electric system. A few weeks ago, officials ruled her off-grid home illegal. Officials cited the [International Property Maintenance Code](#), which mandates that homes be connected to an electricity grid and a running water source.

<http://www.collective-evolution.com/2014/03/09/florida-makes-off-grid-living-illegal-mandates-all-homes-must-be-connected-to-an-electricity-grid/>



# Responses



ONE IN FOUR AMERICANS IS SKEPTICAL ABOUT CLIMATE CHANGE... WHO GIVES A SHIT? THAT DOESN'T MATTER. YOU DON'T NEED PEOPLE'S OPINIONS ON A FACT. YOU MIGHT AS WELL HAVE A POLL ASKING WHICH NUMBER IS BIGGER, 5 OR 15? OR DO OWLS EXIST? OR ARE THERE HATS?

JOHN OLIVER

attn:



# Responses

**New Law in North Carolina Bans Latest Scientific Predictions of Sea-Level Rise  
Aug. 2, 2012**

**By ALON HARISH via [20/20](#)**

**A new law in North Carolina will ban the state from basing coastal policies on the latest scientific predictions of how much the sea level will rise, prompting environmentalists to accuse the state of disrespecting climate science.**

**The law has put the state in the spotlight for what critics have called nearsightedness and climate change denial, but its proponents said the state needed to put a moratorium on predictions of sea level rise until scientific techniques improve.**

**The law was drafted in response to an estimate by the state's Coastal Resources Commission (CRC) that the sea level will rise by 39 inches in the next century, prompting fears of costlier home insurance and accusations of anti-development alarmism among residents and developers in the state's coastal Outer Banks region.**

**Democratic Gov. Bev Perdue had until Thursday to act on the bill known as House Bill 819, but she decided to let it become law by doing nothing.**

<http://abcnews.go.com/US/north-carolina-bans-latest-science-rising-sea-level/story?id=16913782>



# Responses

## HEARTLAND FIGHTS BACK

Left-wing groups commit fraud, but we're fighting back! Join our legal defense fund to remove false and defamatory materials and prosecute the true criminals.



Joseph Goebbels says:







# Responses

## **Increased climate project fundraising**

**Our climate work is attractive to flinders, especially our key Anonymous Donor (whose contribution dropped from \$1,664,150 in 2010 to \$979,000 in 2011 – about 20% of our total 2011 revenue). He has promised an increase in 2012 – see the 2011 Fourth Quarter Financial Report. We will also pursue additional support from the Charles G. Koch Foundation. They returned as a Heartland donor in 2011 with a contribution of \$200,000. We expect to push up their level of support in 2012 and gain access to their network of philanthropists, if our focus continues to align with their interests. Other contributions will be pursued for this work, especially from corporations whose interests are threatened by climate policies.**

<https://skeptic78240.wordpress.com/2014/09/03/heartland-headed-nowhere/>



# Responses

