

# Atmospheric CO<sub>2</sub>: Is it really changing and what can we do about it?

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Office of Polar Programs



Institut Polaire Français



Italian National Research  
Program in Antarctica

# What are the atmospheric gasses that cause the greenhouse effect?

## Not the major gasses:

$\text{N}_2$  78%

$\text{O}_2$  21%

Ar 1%

On earth (unlike venus and mars) it is the **minor gasses** that are responsible for the greenhouse:

$\text{H}_2\text{O}$

$\text{CO}_2$

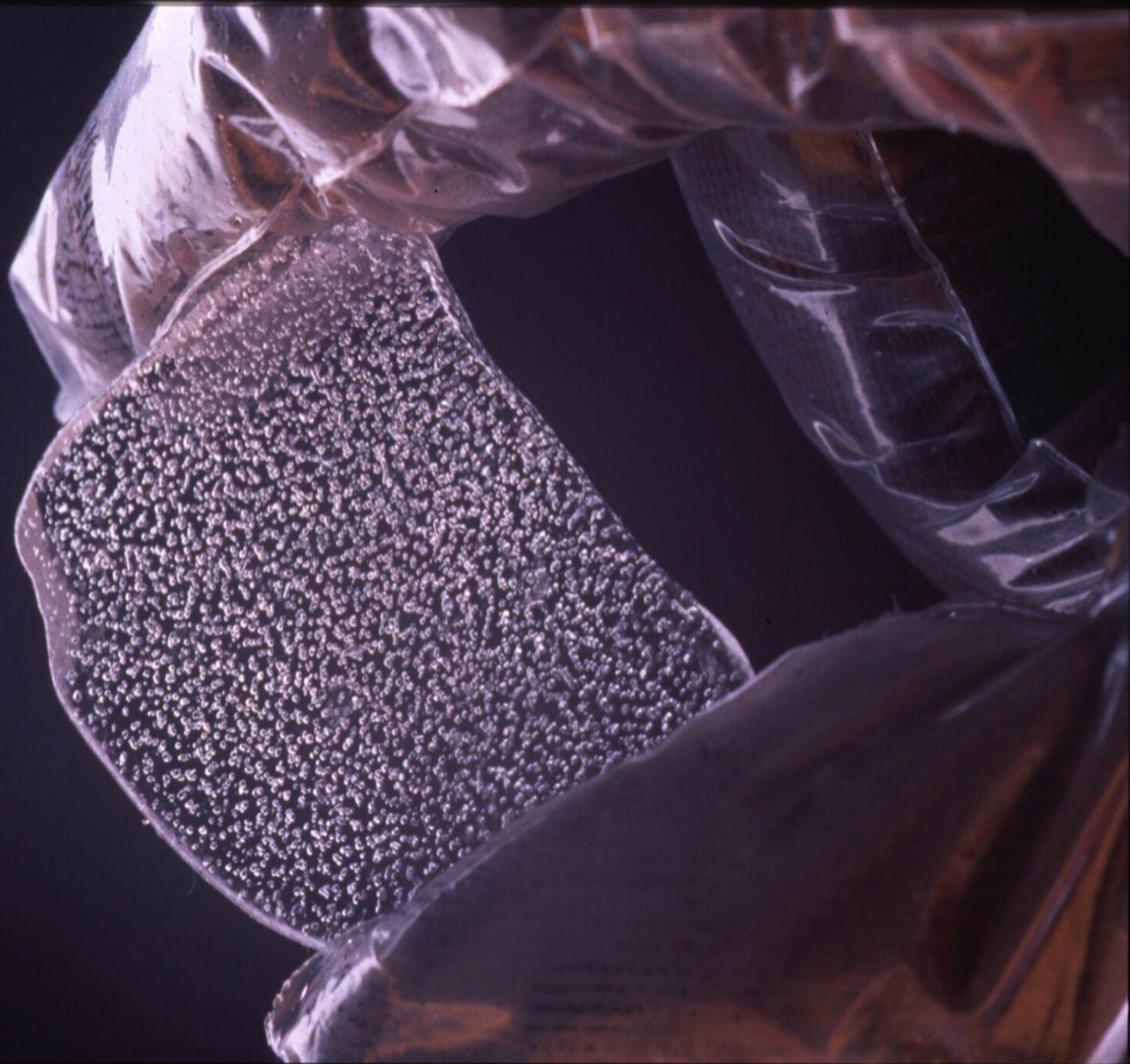
$\text{O}_3$

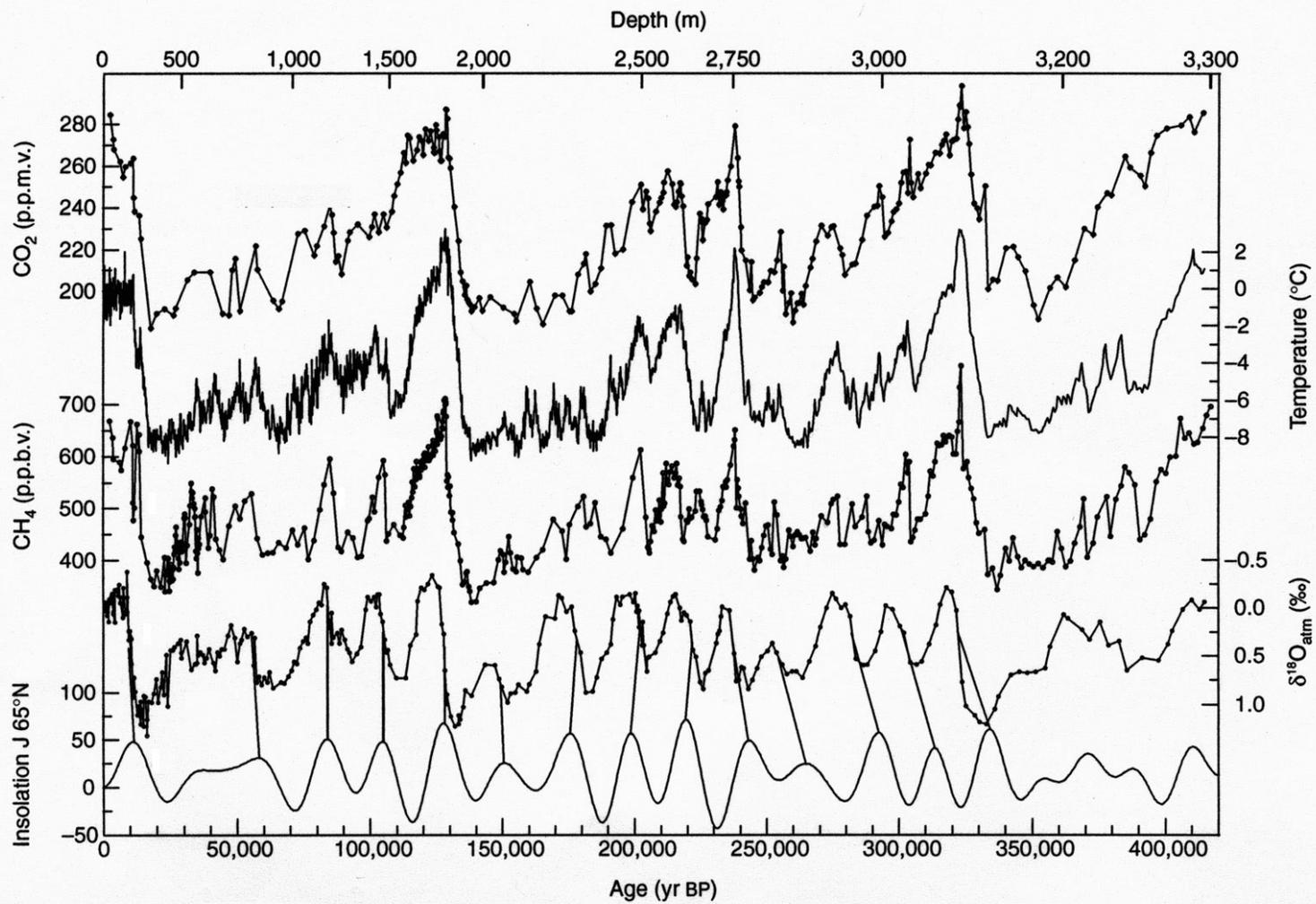
$\text{CH}_4$

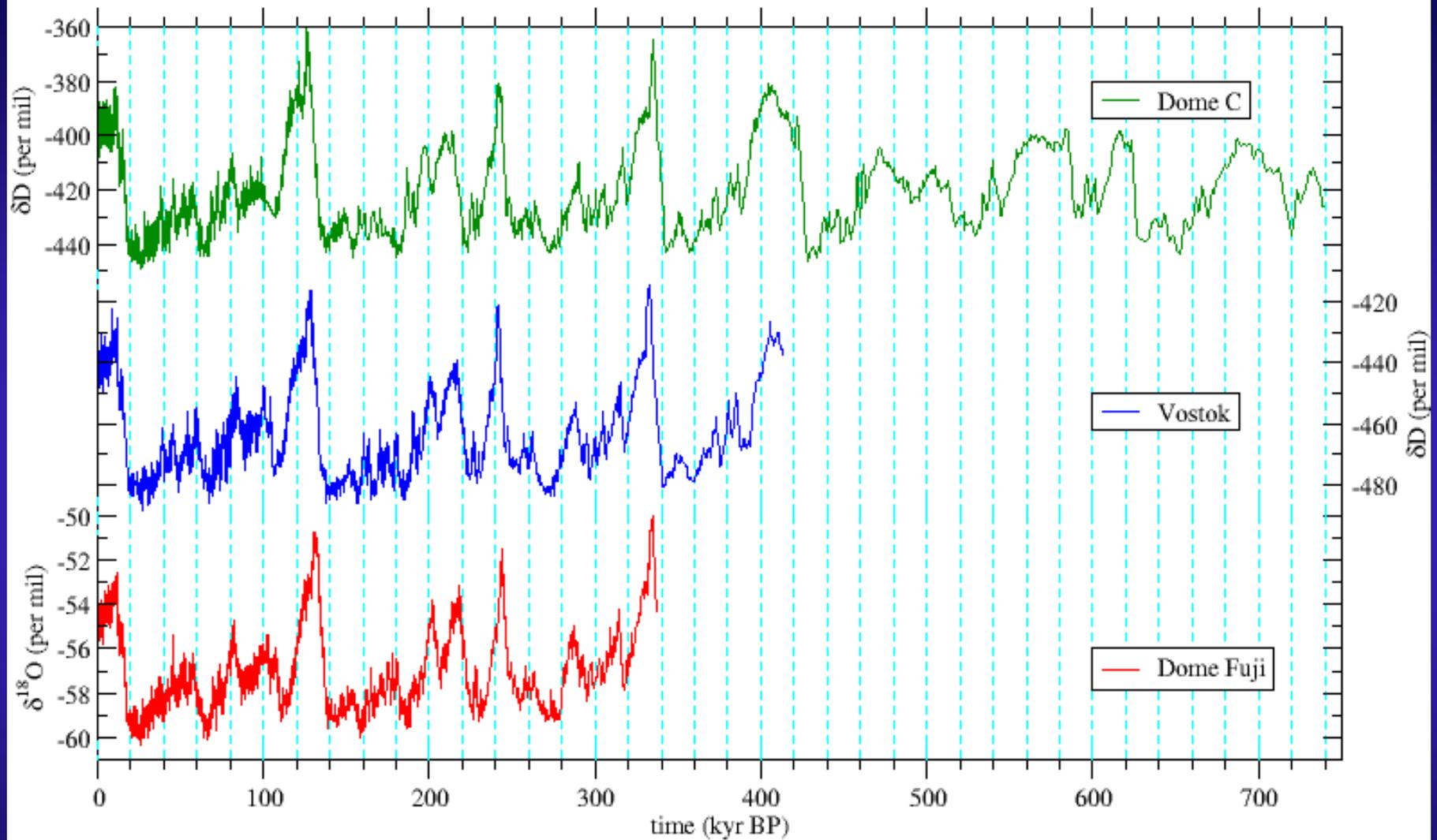
$\text{N}_2\text{O}$

# Determining Earth's past climate

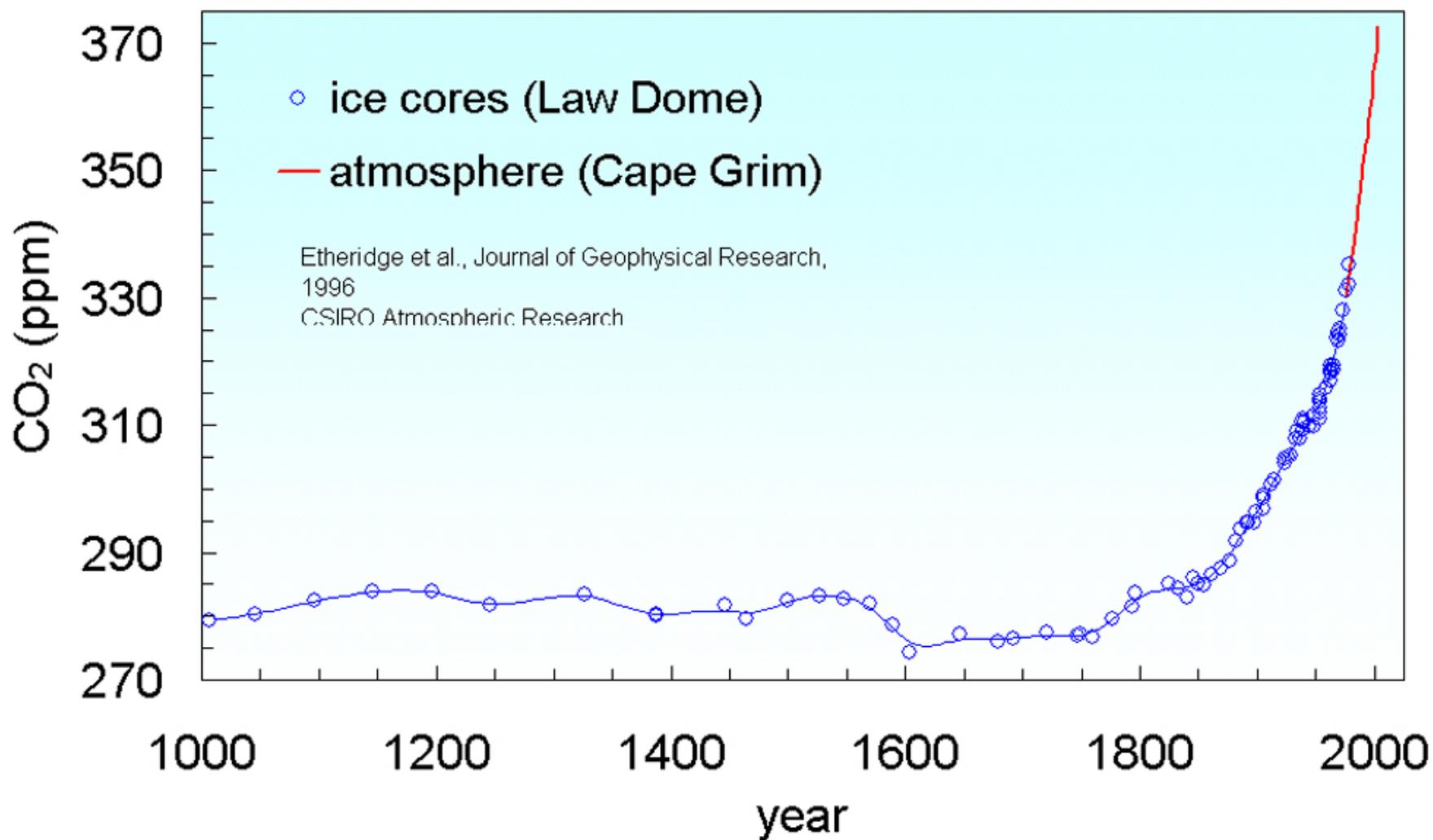
1. Human record (only~2000 years)
2. Ice cores in Antarctica and Greenland.  
(up to 475,000 years ago)
3. Tree ring analysis, extent of pollen deposition  
(up to millions of years)
4. Ocean sediments and geochemistry  
(over a half billion years)





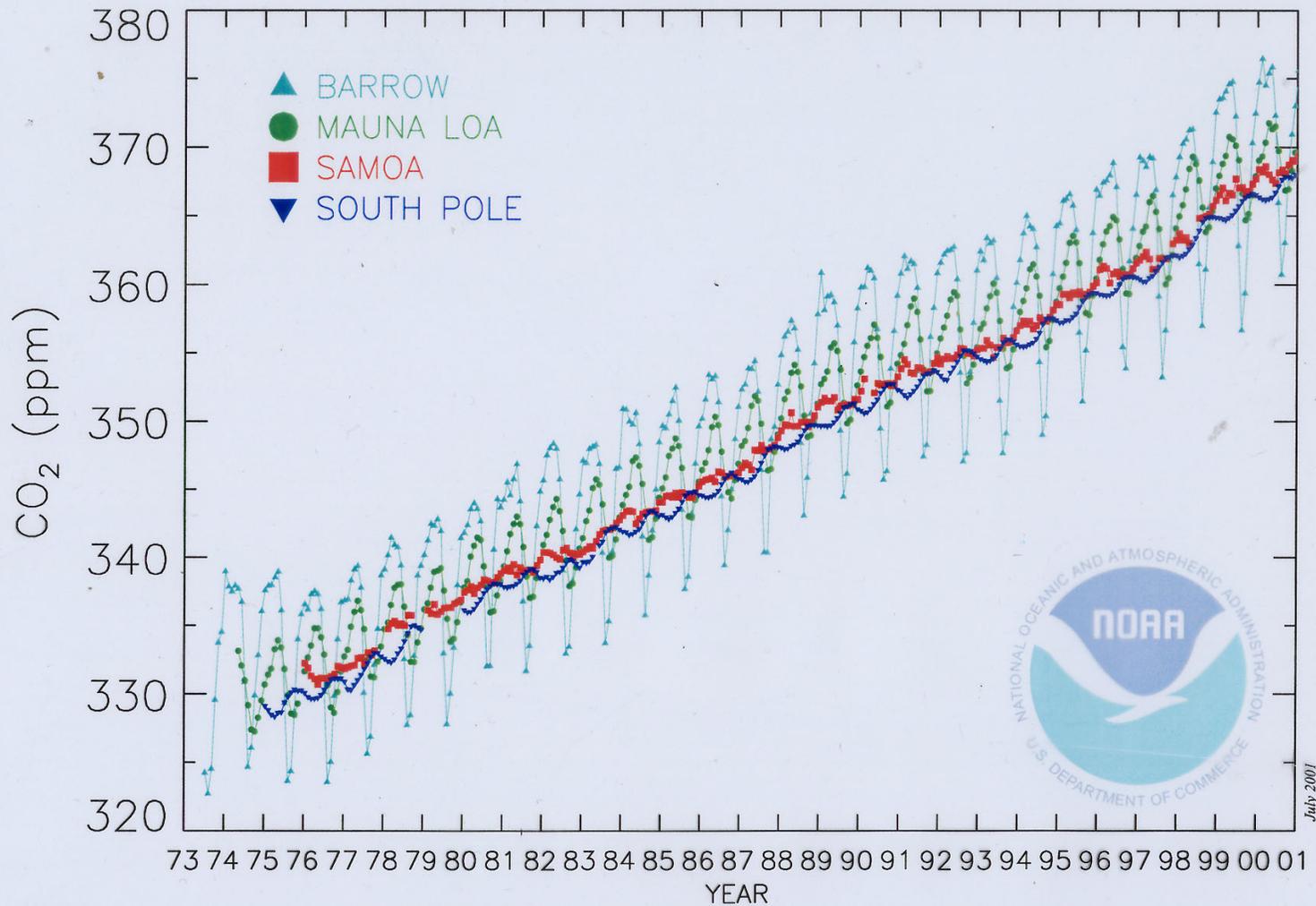


The Dome C  $\delta D$  record resembles Vostok and Dome F records over their common parts

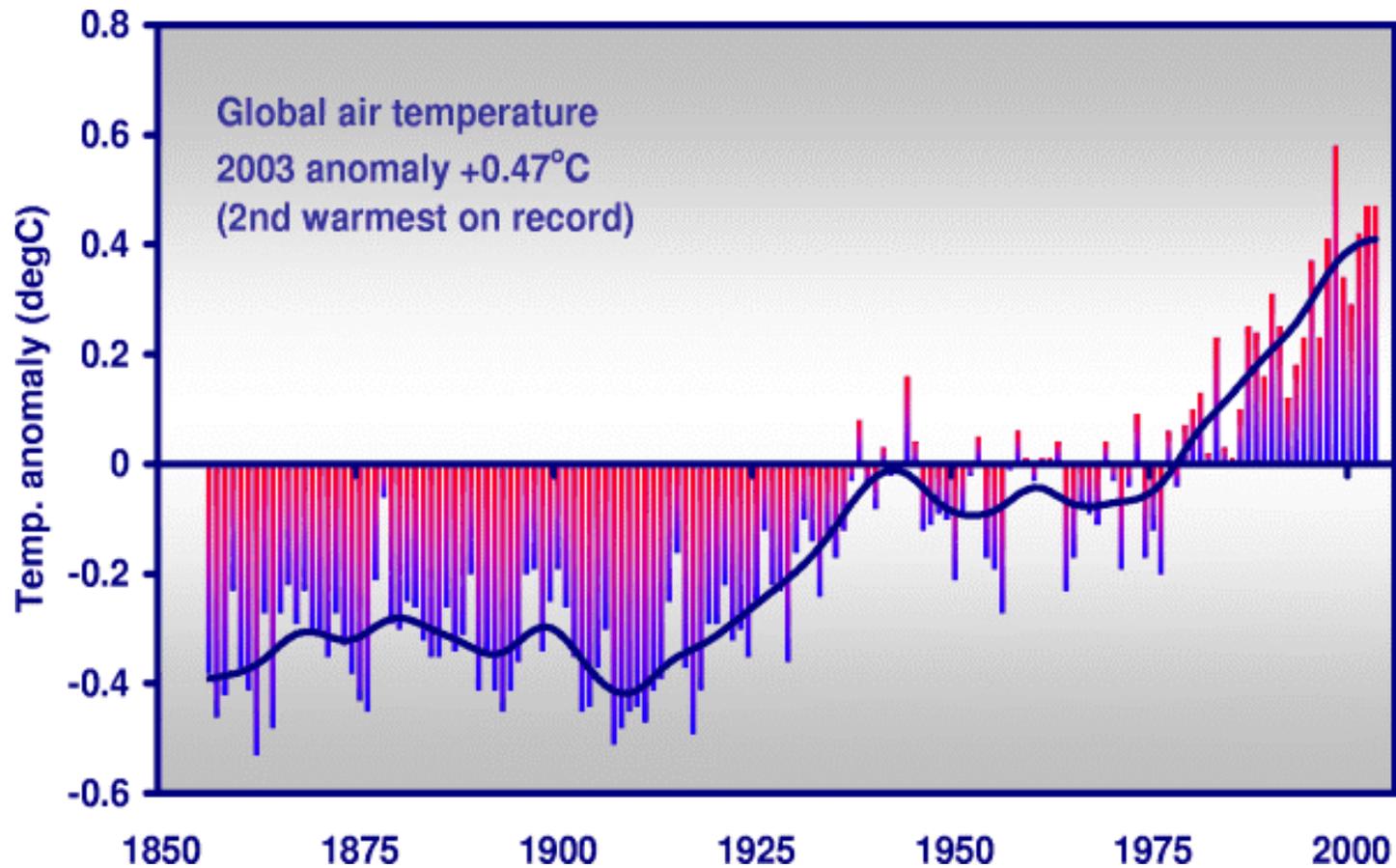


# Monthly Mean Carbon Dioxide

NOAA CMDL Carbon Cycle Greenhouse Gases

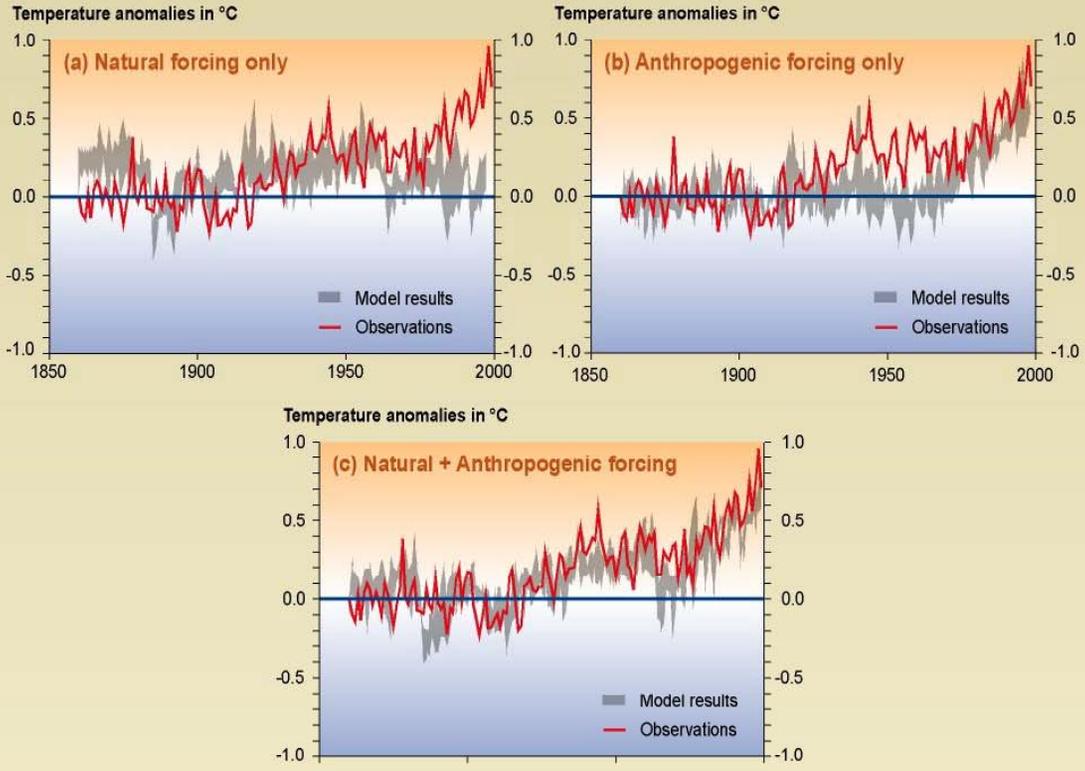


Atmospheric carbon dioxide mixing ratios determined from the continuous monitoring programs at the 4 NOAA CMDL baseline observatories. Principal investigator: Dr. Pieter Tans, NOAA CMDL Carbon Cycle Greenhouse Gases, Boulder, Colorado, (303) 497-6678. ptans@cmdl.noaa.gov.



Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *Journal of Climate*, **16**, 206-223.

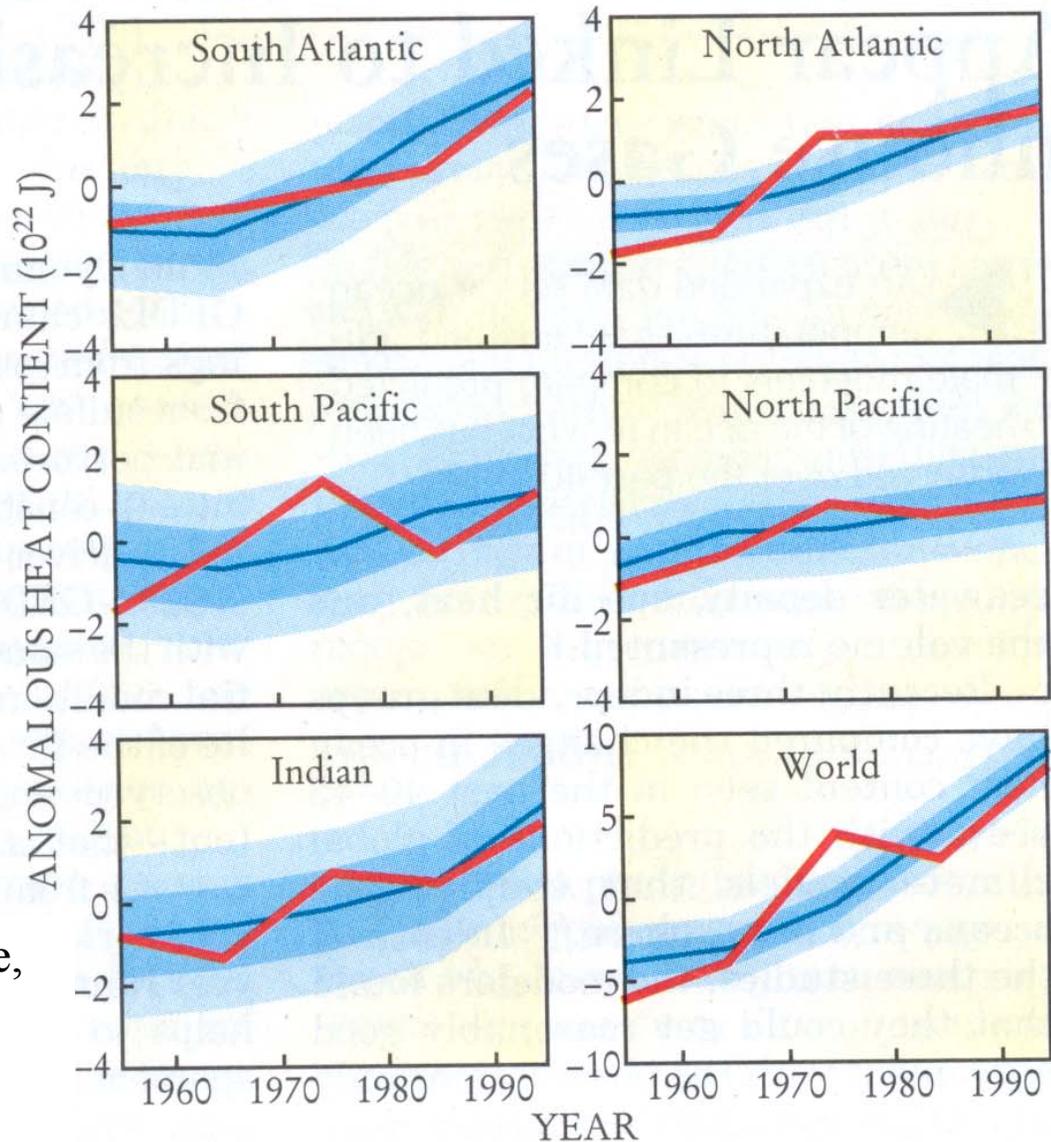
## Comparison between modeled and observations of temperature rise since the year 1860



SYR - FIGURE 2-4

FIGURE 2. HEAT GAIN, ocean-by-ocean. Data are given as 10-year means of the anomalous heat content, measured relative to the average for the 45-year period. The observed values (red) are compared to the ensemble average (blue) of five simulations with greenhouse and sulfate aerosol forcings; they largely fall within the one- and two-standard-deviation ranges (dark and light shadings). (Adapted from ref. 6.)

T.P. Barnett, D.W. Pierce,  
R. Schnur, *Science* **292**,  
270 (2001)



Ok, so burning fossil fuel  
is upsetting Earth's carbon  
cycle, and causing  
unprecedented  
climate warming.

What's a person to do?

# Four things **you** can do:

1. Reduce your use of fossil fuels.
2. Become more efficient in your energy use.
3. Switch to non-carbon based fuels.
4. Lobby politicians to make intelligent choices.

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## CARBON POLLUTION CALCULATOR

**RENEWABLE ENERGY**  
 THE INFINITE POWER  
 OF TEXAS

There's a lot of talk these days about the likelihood that "greenhouse gases," the most common of which is carbon dioxide (CO<sub>2</sub>), will cause the Earth's climate to significantly change. If you're like most Americans, each time you drive your car, hop on a plane, flick on a light, or consume energy in other ways, you contribute in a small way to this effect.

Curious how much? This worksheet allows you to easily tally up your own personal "carbon budget."

- [Enter your energy use](#)
- [Your total contribution](#)
- [Questions and answers](#)

### Atmospheric carbon: What's your share?

<b>Auto Transportation</b>	Yearly <input type="checkbox"/> travel of <input type="text" value="10000"/> miles, at <input type="text" value="35"/> miles per gallon, burns <input type="text" value="286"/> gallons of gasoline annually, putting <input type="text" value="1714"/> pounds of carbon (6 lbs/gal) into our air.
<b>Air Transportation</b>	Yearly <input type="checkbox"/> travel of <input type="text" value="50000"/> miles via commercial airline puts about <input type="text" value="7000"/> pounds of carbon into our air annually.
<b>Home Electric Usage</b>	Monthly <input type="checkbox"/> use of <input type="text" value="0"/> kilowatt-hours of electricity, if your power plant generates power from <input type="checkbox"/> Gas <input type="checkbox"/> puts <input type="text" value="0"/> pounds of carbon into our air each year.
<b>Home Natural Gas Usage</b>	Yearly <input type="checkbox"/> use of <input type="text" value="20"/> Therms (Or ccf - hundred cubic feet) of Natural Gas contributes <input type="text" value="65"/> pounds of carbon to our air each year.
<b>Home Fuel Oil Usage</b>	Monthly <input type="checkbox"/> use of <input type="text" value="0"/> gallons of Fuel Oil adds <input type="text" value="0"/> pounds of carbon to our air each year.

### Your Total Contribution

Your total atmospheric carbon contribution is approximately  pounds per year. That's  pounds of carbon dioxide. Of course, this ignores all of the energy spent to produce all of the goods that you buy...you might want to double these numbers!

### Questions and Answers

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# NEW YORK STATE




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for where you live



Energy Efficiency  
building owners & managers



Energy Smart  
contractors & partners



Energy Efficiency  
in your school

## Welcome to New York's resource for clean, energy-efficient products and solutions.

New York Energy Smart<sup>SM</sup> Program - a partnership between the [New York State Energy Research and Development Authority \(NYSEERDA\)](#) and the [Public Service Commission \(PSC\)](#)

New York Energy Smart<sup>SM</sup> also brings you ENERGY STAR<sup>®</sup>, a program to reduce your energy use with efficient products.

### Special Limited Time Offer on Assisted Home Performance with ENERGY STAR<sup>®</sup>

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 <p><b><u>ENERGY STAR Appliances</u></b></p>	 <p><b><u>Build a home that's 30% more energy efficient.</u></b></p>
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<p><b><u>Training for Building Trades &amp; Specialties</u></b></p>	

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Save money and energy. **New York Energy Smart<sup>SM</sup>** offers a variety of easy programs and practical resources designed to meet your unique needs!

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**Take the Change A Light Challenge and Save!**

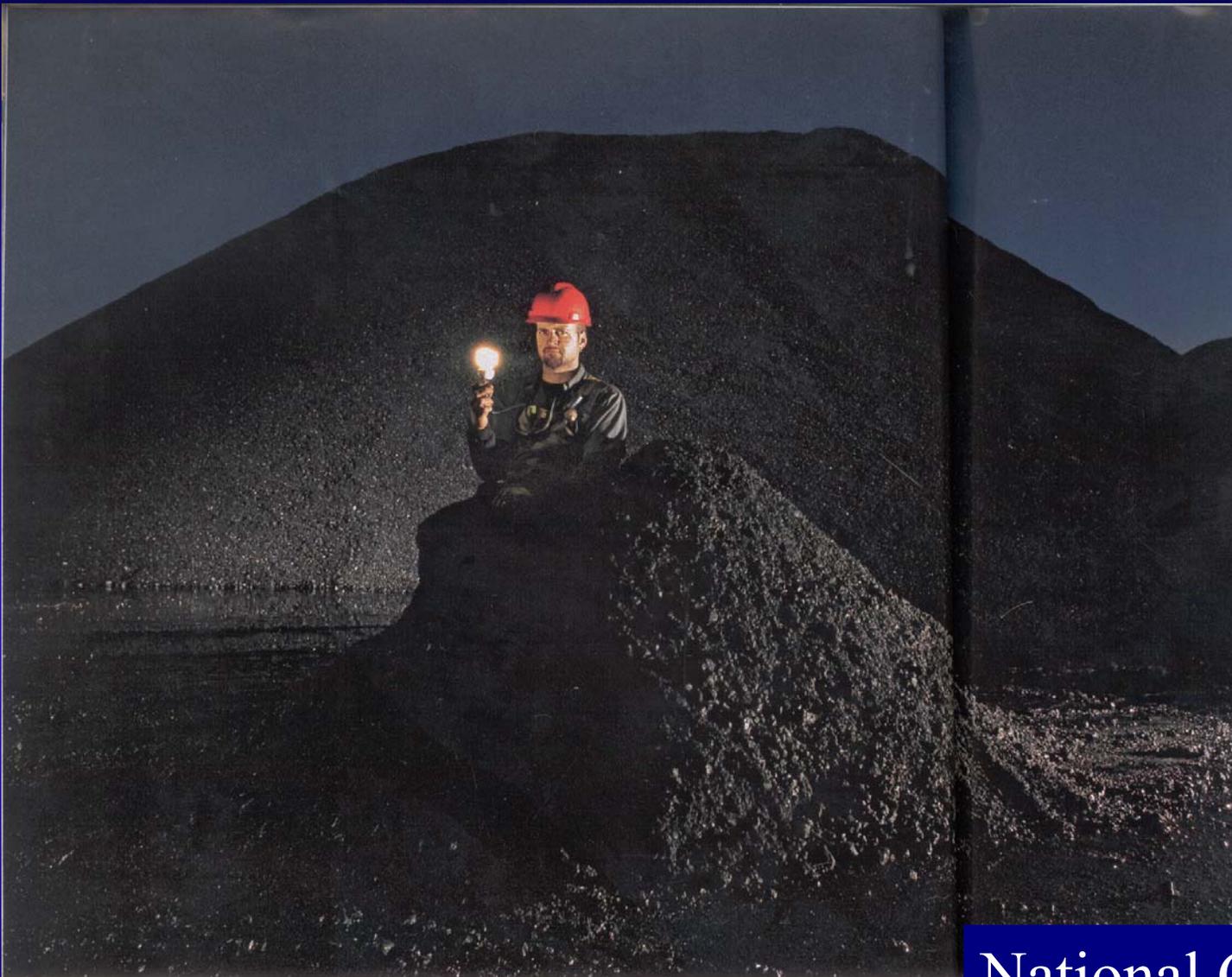
**Reduce energy bill by up to 40%**



Home Performance with ENERGY STAR<sup>®</sup>

**Want more energy-saving information?**

Sign up to have great tips, energy events and program information delivered directly to your inbox.



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REPLACE ONE INCANDESCENT LIGHTBULB  
WITH A COMPACT FLUORESCENT LAMP AND YOU  
WILL SAVE THIS 500 POUND PILE OF COAL.

---

National Geographic  
“After Oil”  
August 2005

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# Solar Land Area Requirements for TOTAL US energy needs



# Solar Land Area Requirements



6 Boxes at 3.3 TW Each



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## Solar

Photo showing solar panels on roof

NYSERDA's Solar Electric Programs are designed to help develop and implement a sustainable market for [grid-connected](#) solar electric or photovoltaic (PV) energy for all applications. Whether you are interested in a solar electric system for your home, business, school, or farm, NYSERDA has information and tools to help you make an informed decision about investing in a solar electric system. For example, the [Clean Power Estimator](#) is a great tool for evaluating the costs and benefits of a PV system. Once you are ready to purchase a system, NYSERDA has [financial incentives](#) available to qualified New York residents to help reduce installed system costs by nearly 50% if you work with an [eligible installer](#), NYSERDA also has programs to help develop and implement [technical training programs](#) for system installers, utility and local inspectors, and others to insure that your system is installed and operates reliably for many years.

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**NYSERDA**

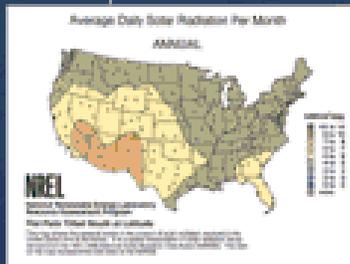


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# PV SYSTEMS

PHOTOVOLTAIC (PV)  
PANELS  
PRODUCE  
ELECTRICITY

- A solar roof can provide from 1/3 to 2/3 of the average homes electricity needs.
- What a difference a day can make. In one sunny day in Georgia, enough solar energy is available to power all the homes in the state for 20 years!



TO LIGHTING,  
APPLIANCES, ETC.

ELECTRICAL  
PANEL

DC  
POWER

INVERTER  
DC TO AC

AC  
POWER

UTILITY

*Unused electricity produced  
by the PV can be sent  
back to the utility.*











umber of Panels	X	Panel Size in Watts	=	System Size in Watts	Cost Before Incentive	NYSERDA Incentive	Customer Cost	NYS Income Deduction	Final Cost
60	X	170	=	10200	\$84,186	\$40,800	\$43,386	\$3,750	\$39,636
57	X	170	=	9690	\$80,380	\$38,760	\$41,620	\$3,750	\$37,870
54	X	170	=	9180	\$76,525	\$36,720	\$39,805	\$3,750	\$36,055
51	X	170	=	8670	\$72,619	\$34,680	\$37,939	\$3,750	\$34,189
48	X	170	=	8160	\$68,663	\$32,640	\$36,023	\$3,750	\$32,273
45	X	170	=	7650	\$64,808	\$30,600	\$34,208	\$3,750	\$30,458
42	X	170	=	7140	\$58,997	\$28,560	\$30,437	\$3,750	\$26,687
39	X	170	=	6630	\$55,091	\$26,520	\$28,571	\$3,750	\$24,821
36	X	170	=	6120	\$51,286	\$24,480	\$26,806	\$3,750	\$23,056
33	X	170	=	5610	\$47,330	\$22,440	\$24,890	\$3,750	\$21,140
30	X	170	=	5100	\$43,224	\$20,400	\$22,824	\$3,750	\$19,074
27	X	170	=	4590	\$39,619	\$18,360	\$21,259	\$3,750	\$17,509
24	X	170	=	4080	\$35,575	\$16,320	\$19,255	\$3,750	\$15,505
21	X	170	=	3570	\$31,670	\$14,280	\$17,390	\$3,750	\$13,640
18	X	170	=	3060	\$25,809	\$12,240	\$13,569	\$3,392	\$10,176
15	X	170	=	2550	\$21,753	\$10,200	\$11,553	\$2,888	\$8,665
12	X	170	=	2040	\$18,097	\$8,160	\$9,937	\$2,484	\$7,453

**This is just a ball park estimate - upon request a formal estimate**  
**This estimate does not include your Counties Sales Tax on Material - NYS & Es**  
 NYSERDA will only incentive a solar system up 110% of a customers annual

2500 watt solar system is 22' long X 8' high X 7' wide  
 2006 NYS Tax credit goes to 25% to a max of \$5,000  
 2006 Federal Tax credit will be 25% to a max of \$2,000

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