Hastily constructed presentation on carbon emissions

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For NOAA ESRL meeting, May 15 2008

Marland & friends

National Carbon Assessments

Fossil Carbon

Embodied Carbon

Standing Woody Biomass

Have already done

Annual C emissions for each state

Monthly C emissions for USA total

Jay Gregg and Bob Andres will Expand to

Monthly C emissions for each state

Monthly C emissions for other countries

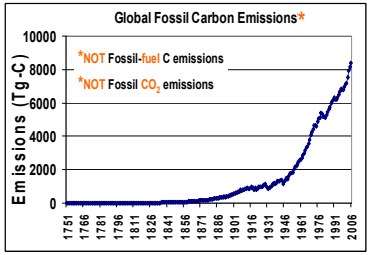
Collaboration with Vulcan

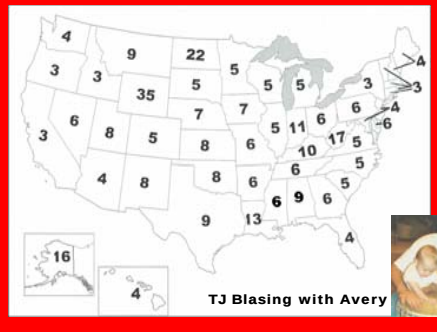
Carbon tracker

Sulfur tracker

CARBON EMITTED	=	AMOUNT OF FUEL (tonne, bbl, m^3)	X	HEAT CONTENT (joules/amount)	X	CARBON COEFFICIENT (grams-C/megajoule)	X	COMBUSTION EFFICIENCY (Typically around 99%)

Documentation of Global Fossil Carbon Emissions Was Necessary to Establish the Anthropogenic Source and its Contribution to the Global Carbon Budget





Works well for:
(1) state/national averages
(2) daily/hourly data at point sources.

FOSSIL-FUEL EMISSIONS / kWh OF ELECTRICITY

NATURAL GAS

$$\frac{14.47\ \text{g-C}}{(1000\ \text{Btu})} \times \frac{3.413\ (1000\ \text{Btu})}{\text{kWh}} \times 3 = \frac{148\ \text{g-C}}{\text{kWh}}$$

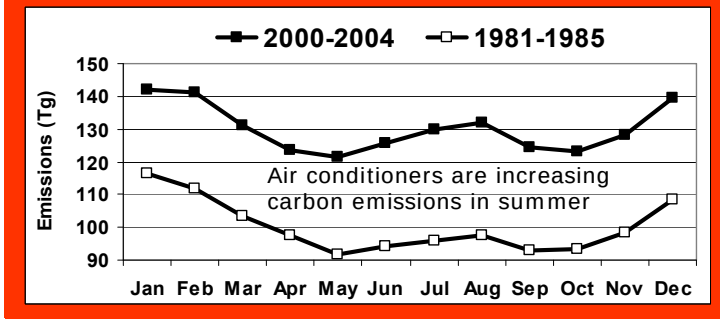
COAL

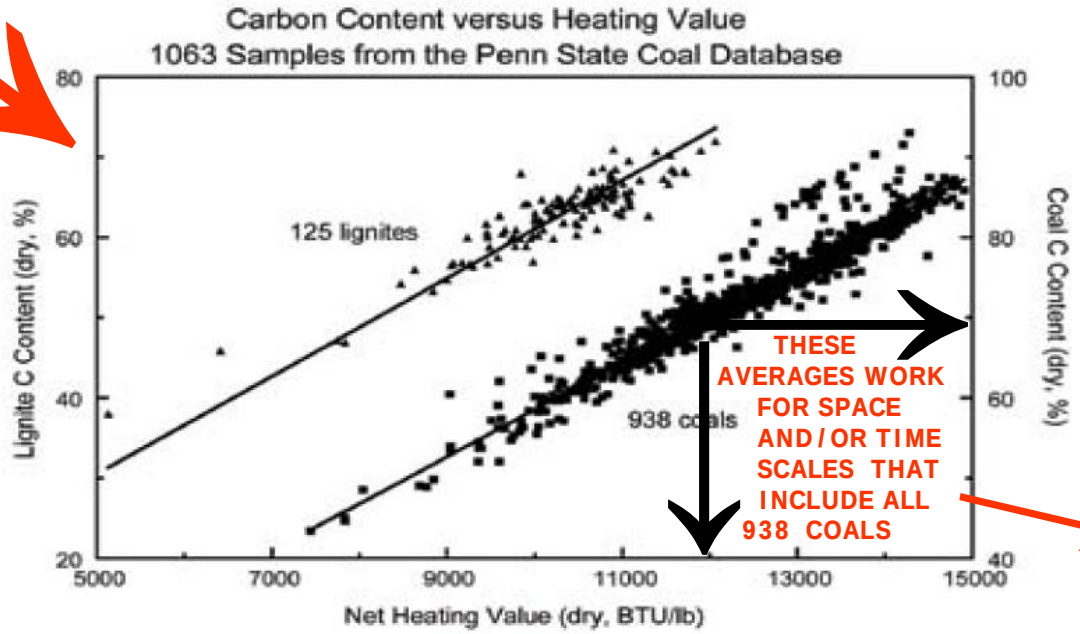
$$\frac{25.76\ \text{g-C}}{(1000\ \text{Btu})} \times \frac{3.413\ (1000\ \text{Btu})}{\text{kWh}} \times 3 = \frac{264\ \text{g-C}}{\text{kWh}}$$

BUT: line/transfer losses & power to run the generating facility means that about 1.15 watts must be generated to move 1 watt through to your coffee pot.

For a Coal-fired power plant:

264 X 1.15 = 304 g-C = 1113 g CO_2 = 2.45 lbs CO_2 per kWh delivered to your coffee pot.





THESE AVERAGES WORK FOR SPACE AND/OR TIME SCALES THAT INCLUDE ALL 938 COALS

On average, this is a dead duck.

FOR FINER SCALES

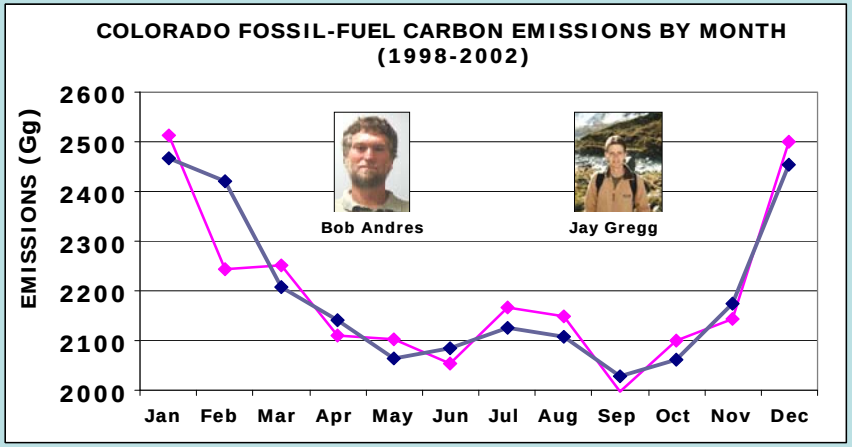
Large Point Sources Need plant-specific fuel data

Gaby and Anjalie

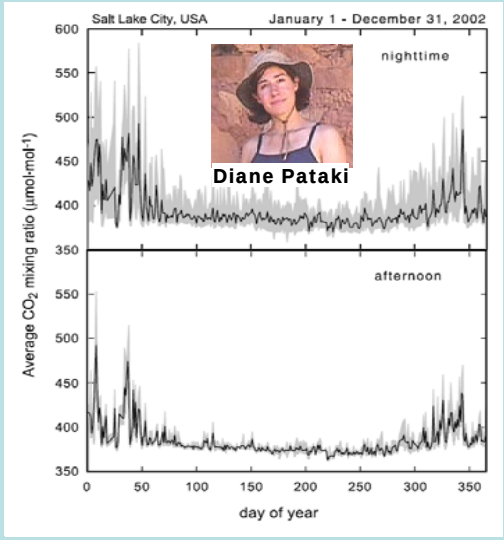
Specifying seasonal cycles for cities and states requires proxy data

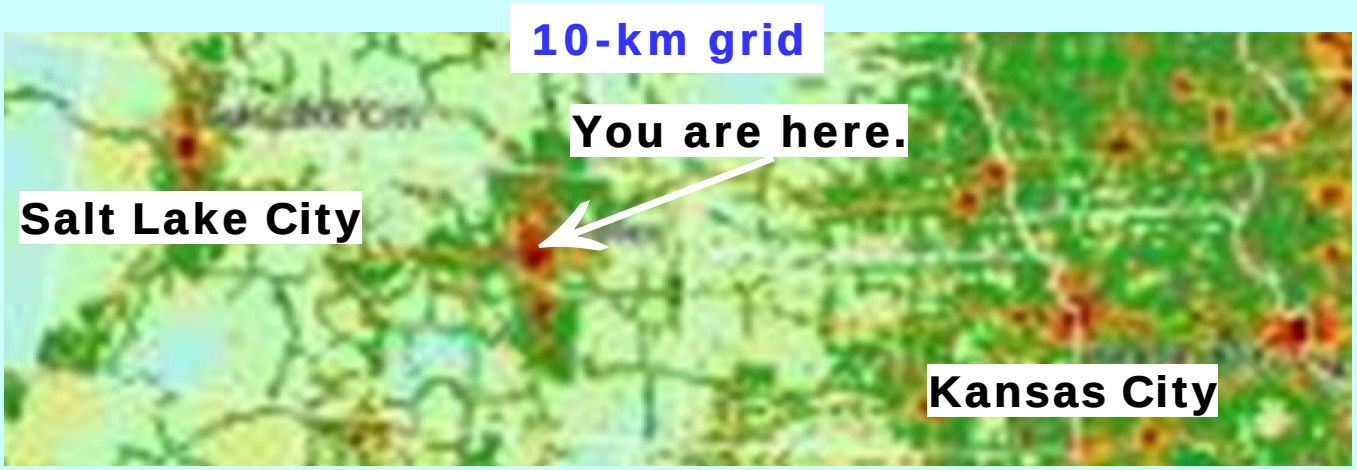
Home heating data

Gasoline sales



Atmospheric ^{13}C





VULCAN results
from Kevin Gurney

Tracking carbon emitted from the *Daytona 500*

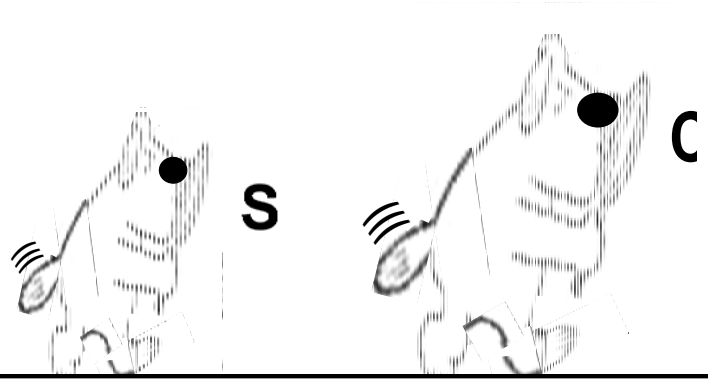
Jesse Miller with beer

DURING THE RACE

AFTER THE RACE

THE FUTURE

After Carbon Tracker, What next ?



SF_5CF_3	Atmospheric lifetime =	800 years	GWP = 17,700
SF_6	Atmospheric lifetime =	3200 years	GWP = 16,300