

# Overview of Climate Change and Impacts

December 11, 2008

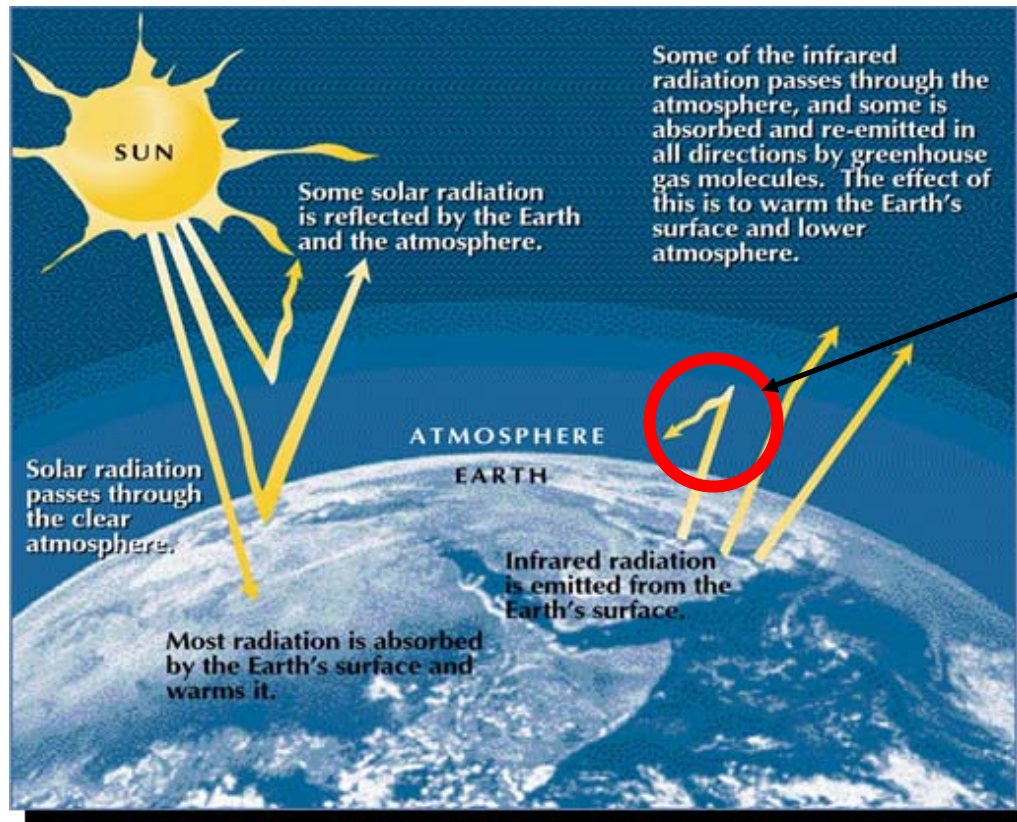
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# The Greenhouse Effect



Greenhouse Gases (GHGs) cause a blanket effect, keeping heat in the earth's atmosphere.

Source: U.S. EPA State and Local Climate Change Outreach Kit, March 2000

# Greenhouse Gases (GHGs)

## *Natural and Anthropogenic\*:*

- Carbon Dioxide(CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Nitrous Oxide (N<sub>2</sub>O),
- Ozone (O<sub>3</sub>), and
- Water Vapor (H<sub>2</sub>O)

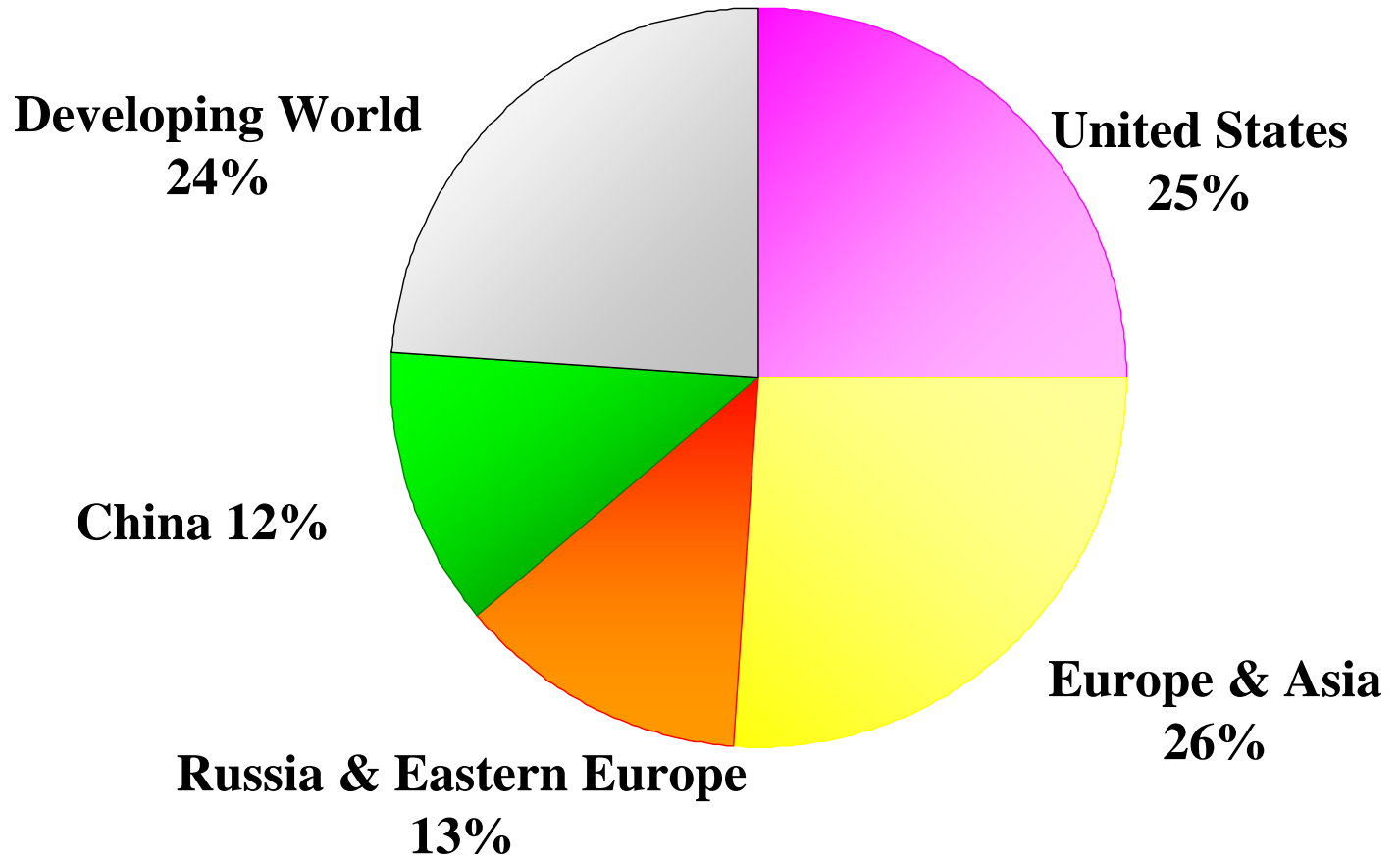
\*Caused by humans

## *Anthropogenic:*

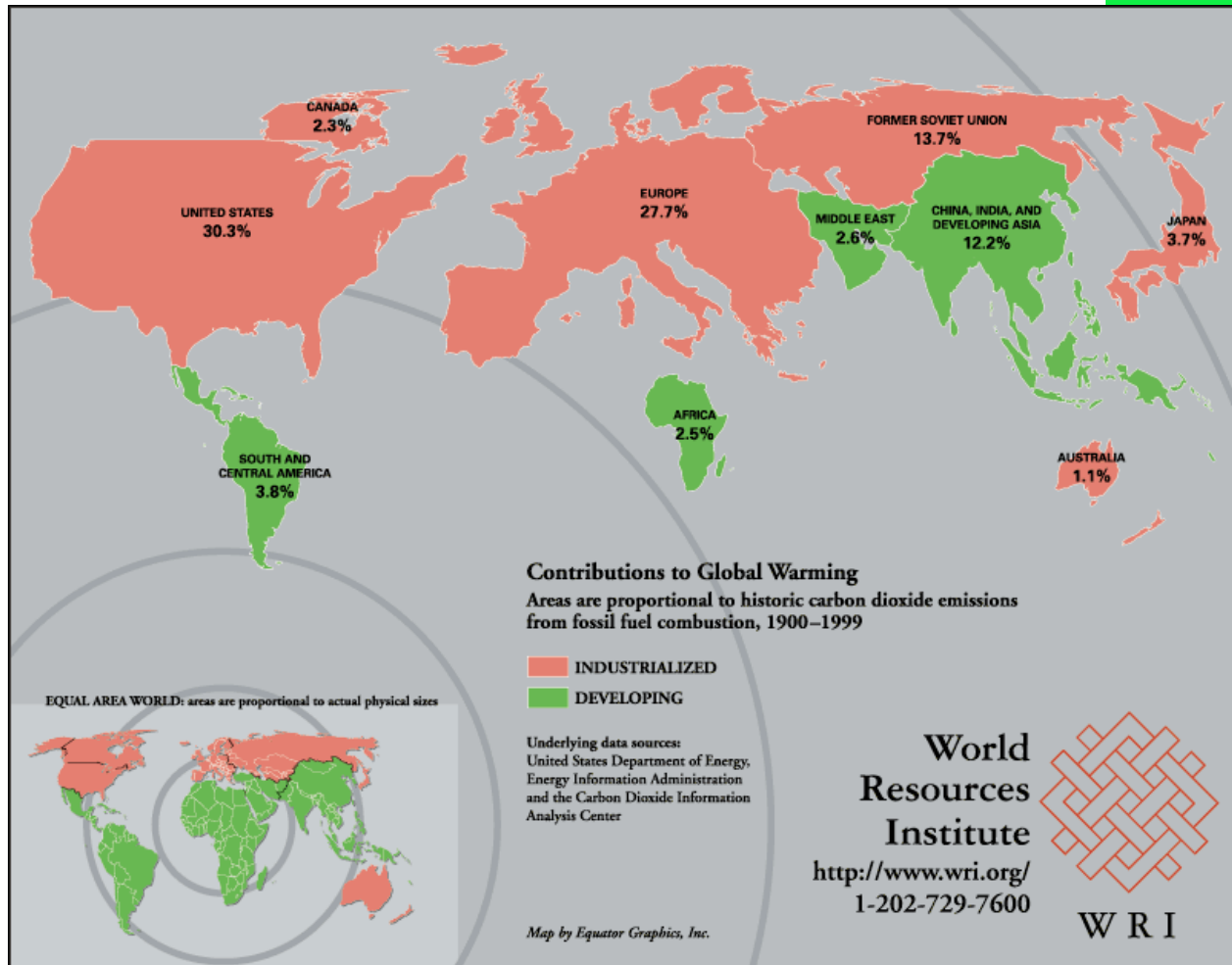
- HFCs
- PFCs
- Sulfur Hexafluoride (SF<sub>6</sub>)
- HCFCs

➤ Red denotes: AB32 GHGs

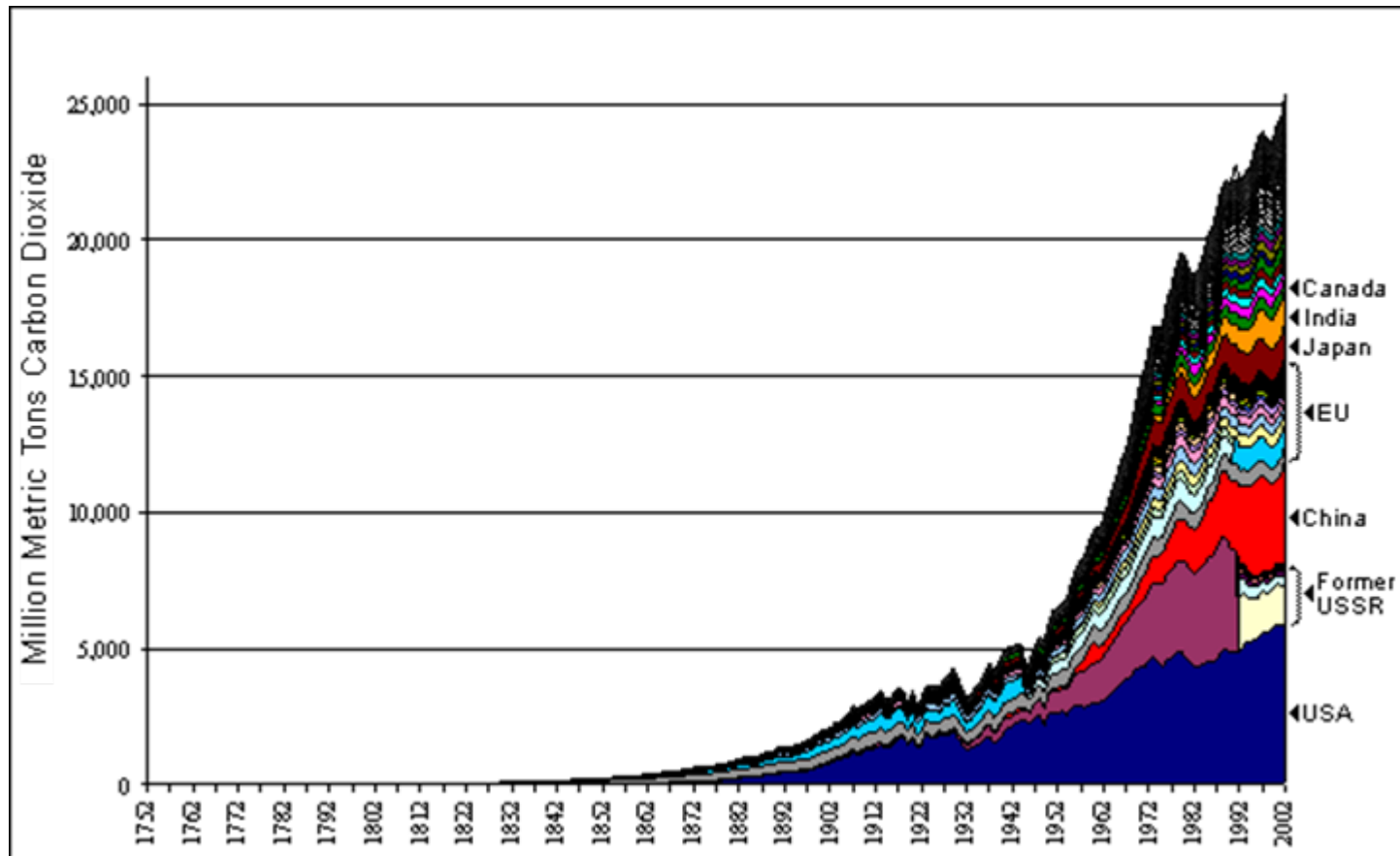
# World Contributions in 1998



# World Contributions

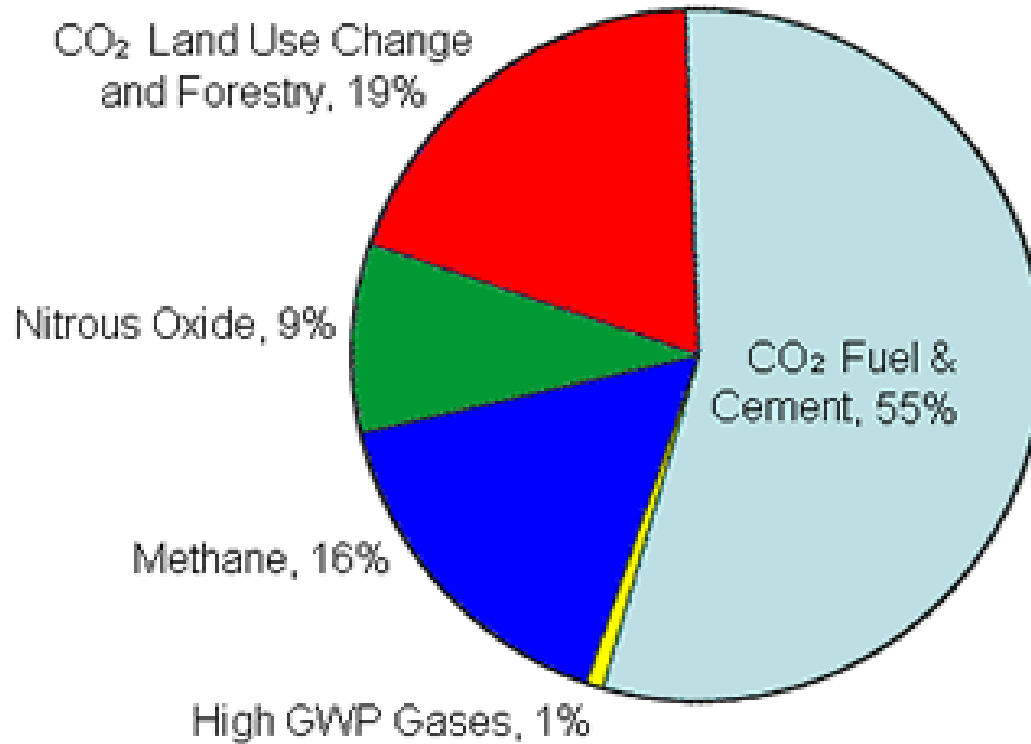


# U.S. EPA – Global CO2 Emissions from Fossil Fuel, Cement, and Flaring



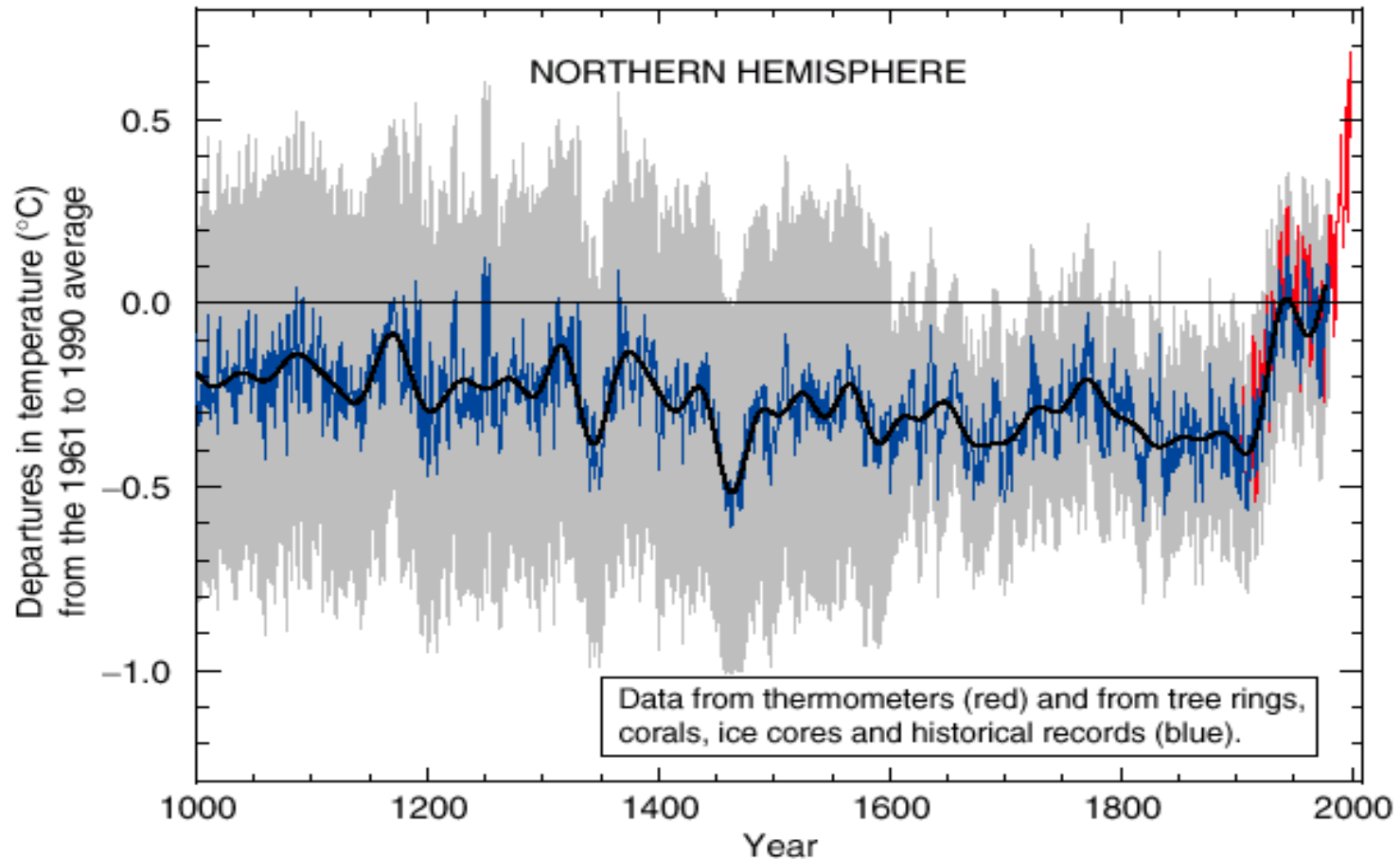
Reference: [Carbon Dioxide Information Analysis Center](#)

# Global GHG Emissions - 2000



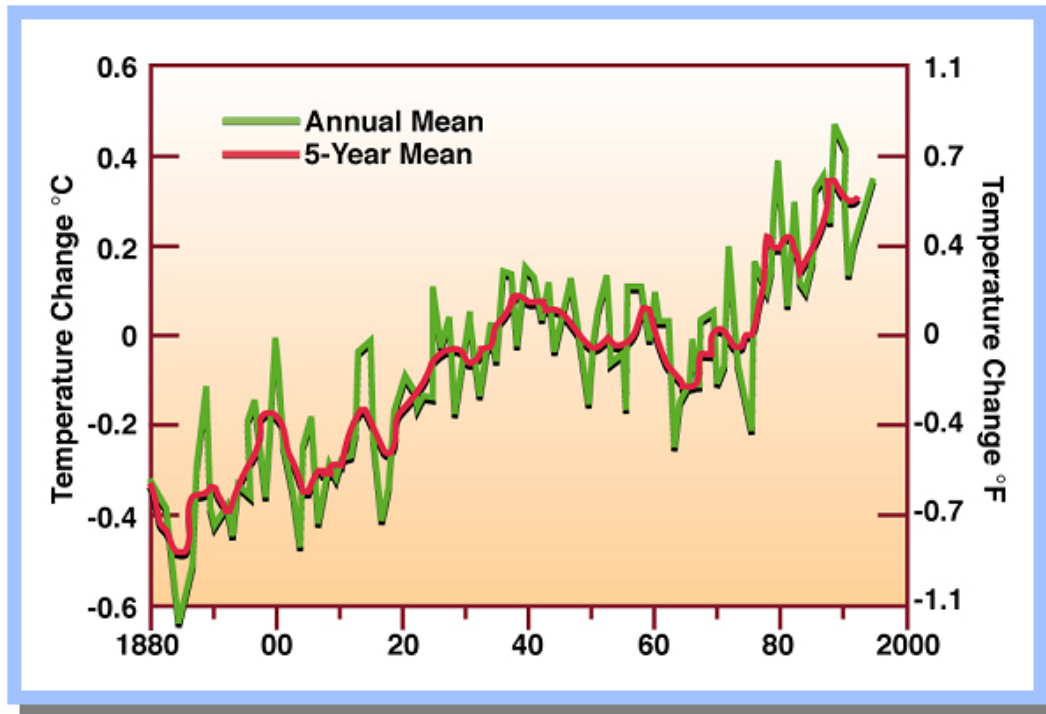
Reference: EPA, [Methane to Markets Partnership Fact Sheet Brochure](#)

# Measured Temperatures are Rising





# Observed Global Surface Air Temperatures

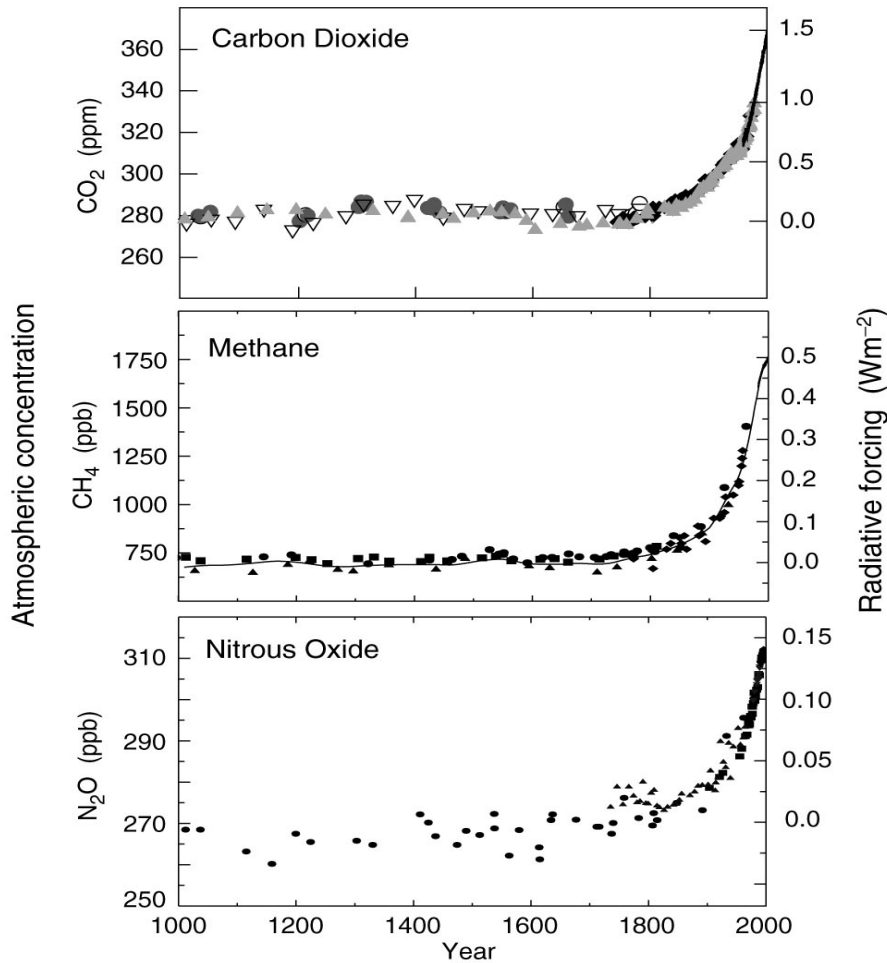


- **+1 °C (almost 2 °F) since 1880**
- **Melting of glaciers**
- **Sea level rose 4-8''**
- **+2 to 6 °F predicted by 2100**

Source: Adapted from NASA Goddard Institute for Space Studies, New York

# Industrial Era Impacts on GHGs

(a) Global atmospheric concentrations of three well mixed greenhouse gases



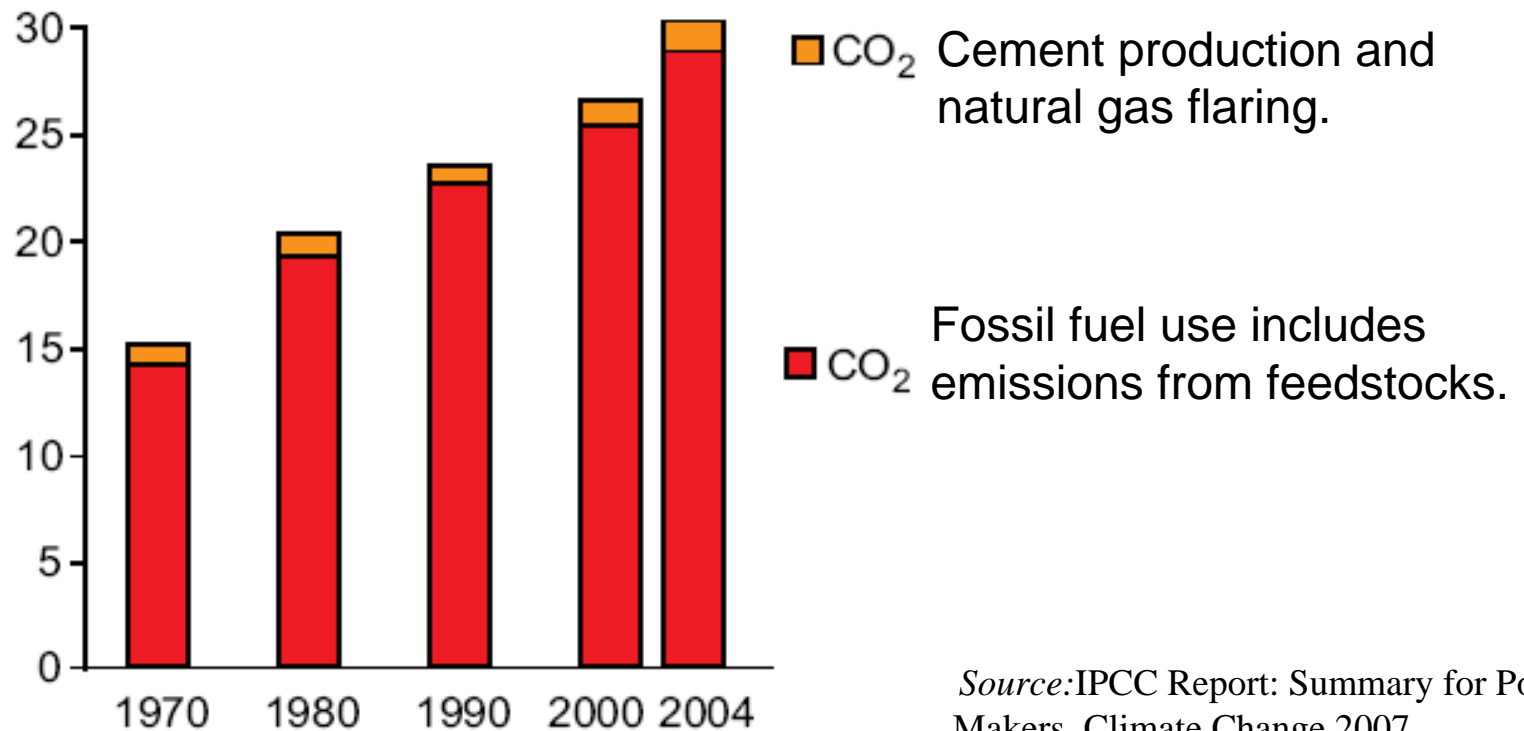
- Carbon dioxide, methane, nitrous oxide, and other pollutants cause global warming
- UN's IPCC\* concludes increase in these gases is a result of human activities

\* Intergovernmental Panel on Climate Change

Source: IPCC Report: Summary for Policy Makers, Climate Change 2001: The Scientific Basis

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# The Recent Rise in CO<sub>2</sub> Output



Source: IPCC Report: Summary for Policy Makers, Climate Change 2007

# Lyell Glacier, Yosemite Natl. Park

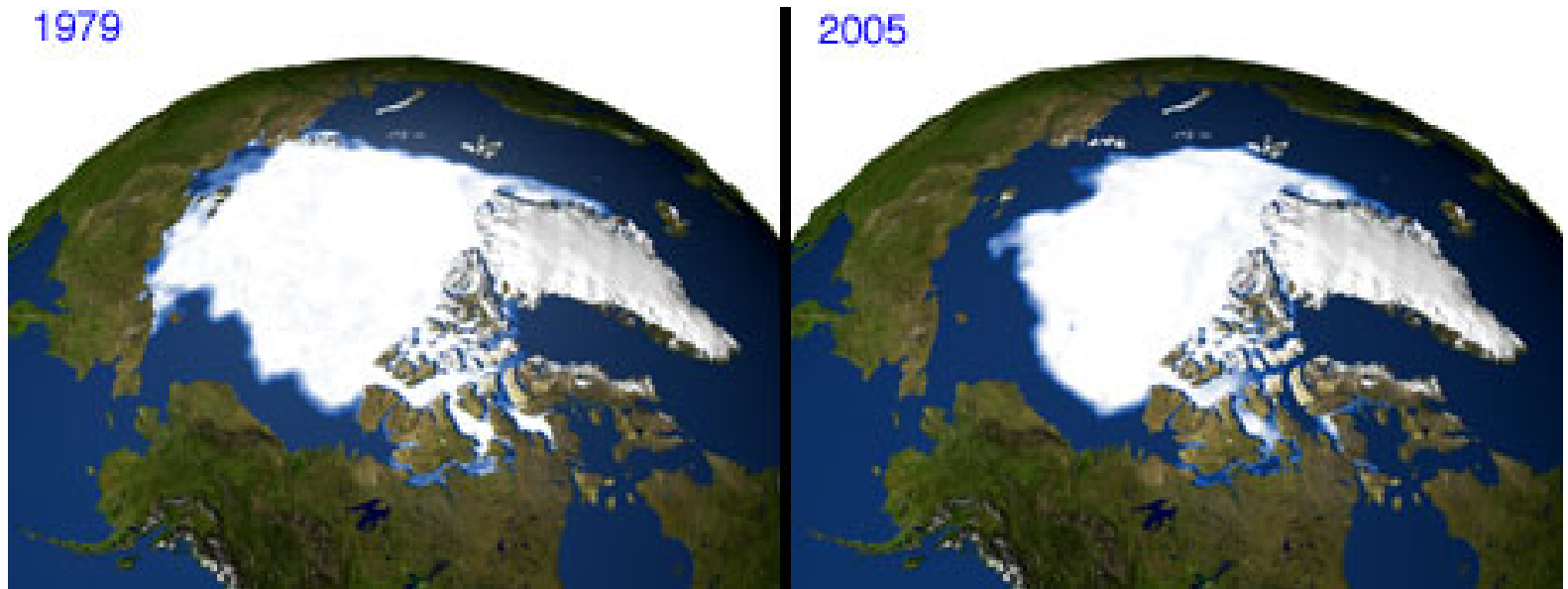


1903



2003

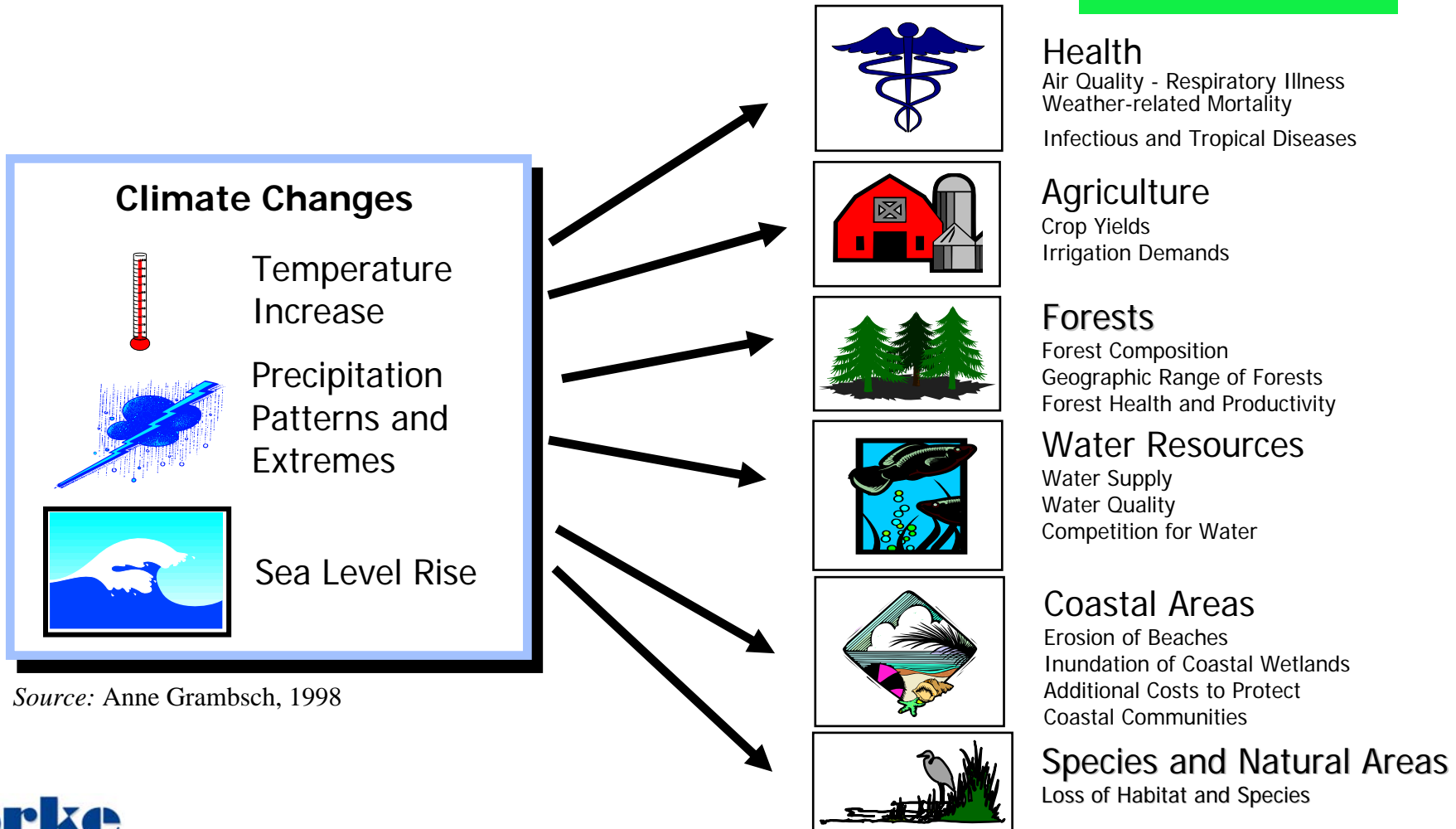
# Arctic Minimum Sea Ice, End of Summer, 1979 and 2005



*Images courtesy NASA*

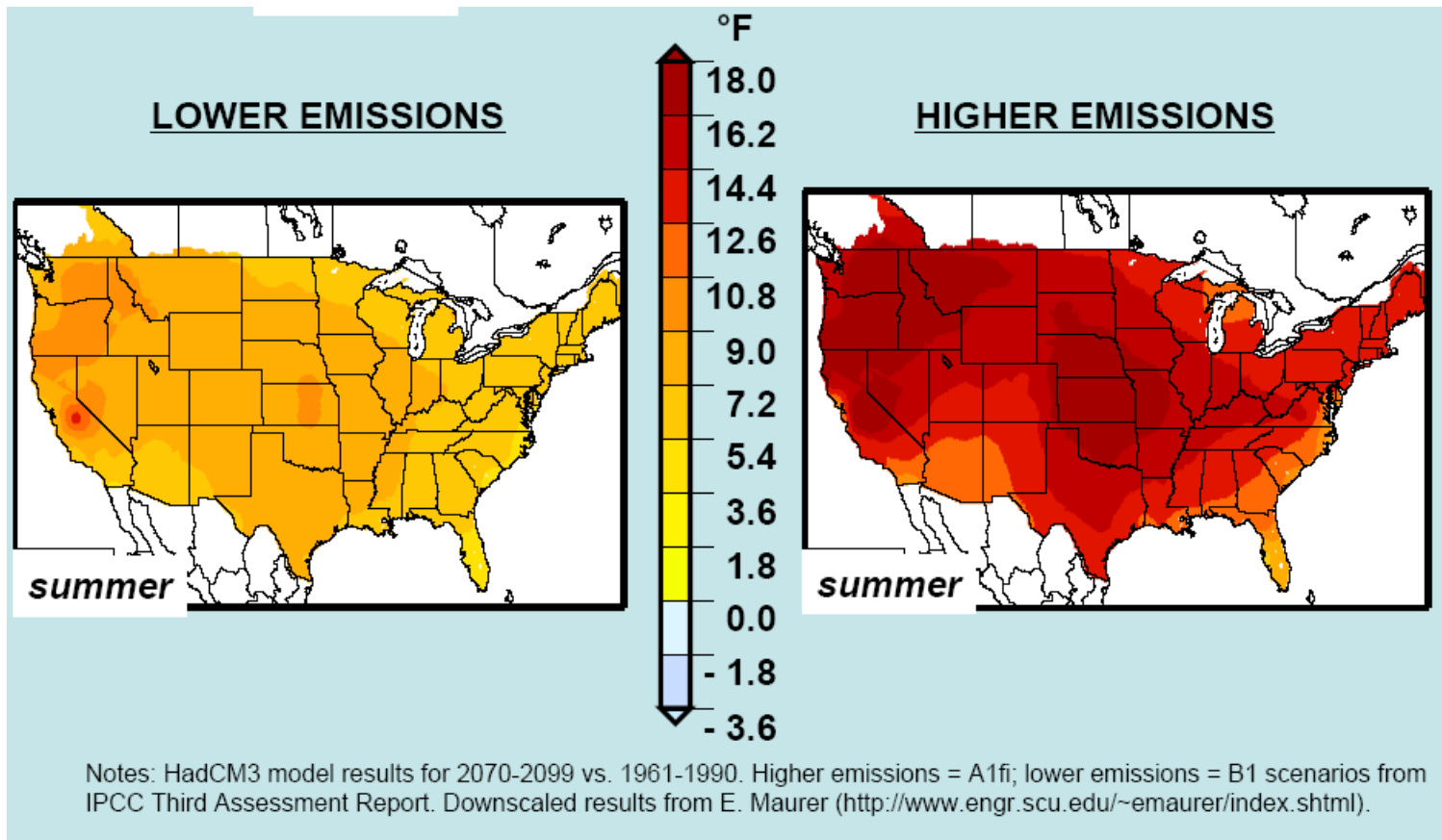
If global warming continues unabated, computer models predict that the Arctic will have no more sea ice in the summer by 2040.

# Potential Climate Change Impacts

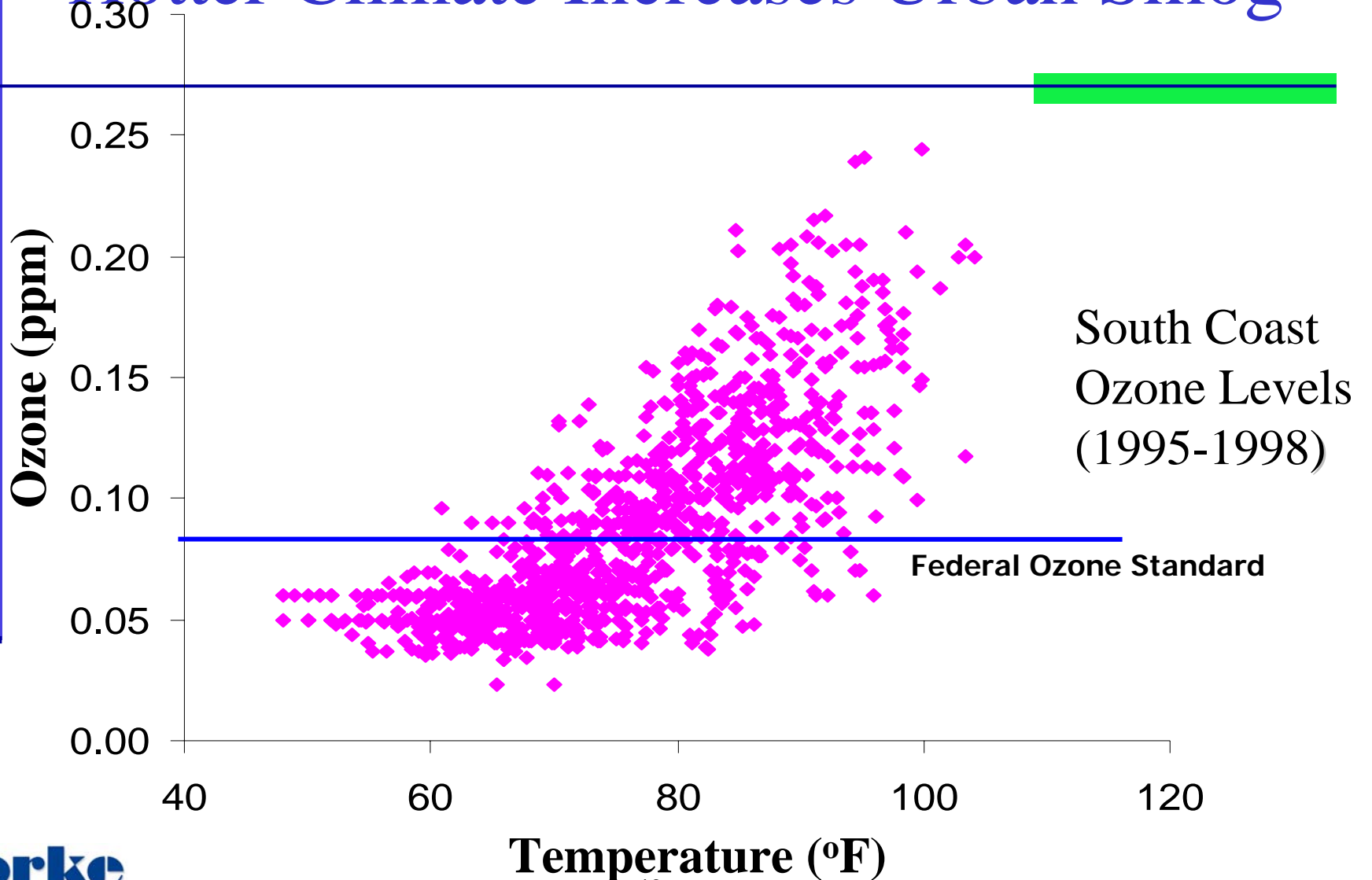


Source: Anne Grambsch, 1998

# Projected End of Century Increases (Summer Average)

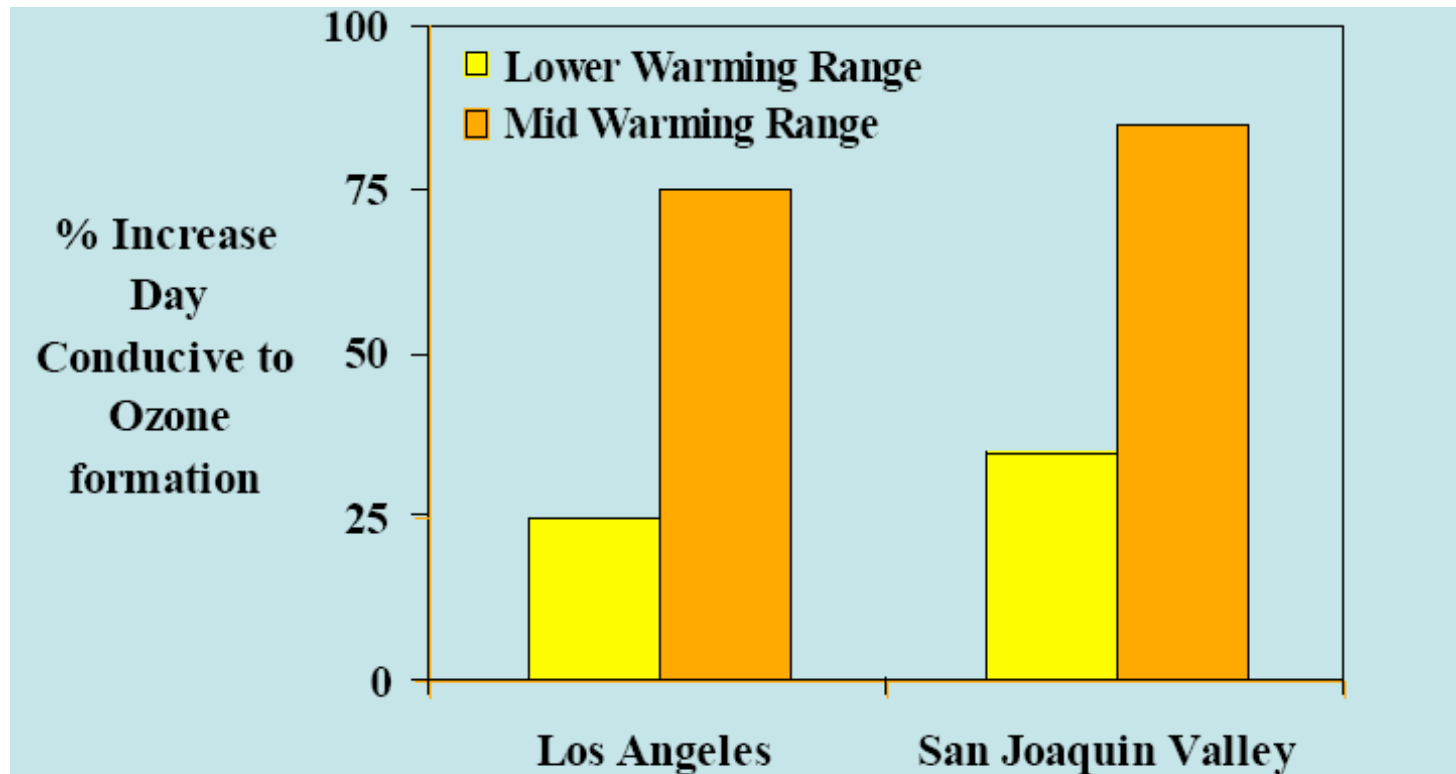


# Hotter Climate Increases Urban Smog





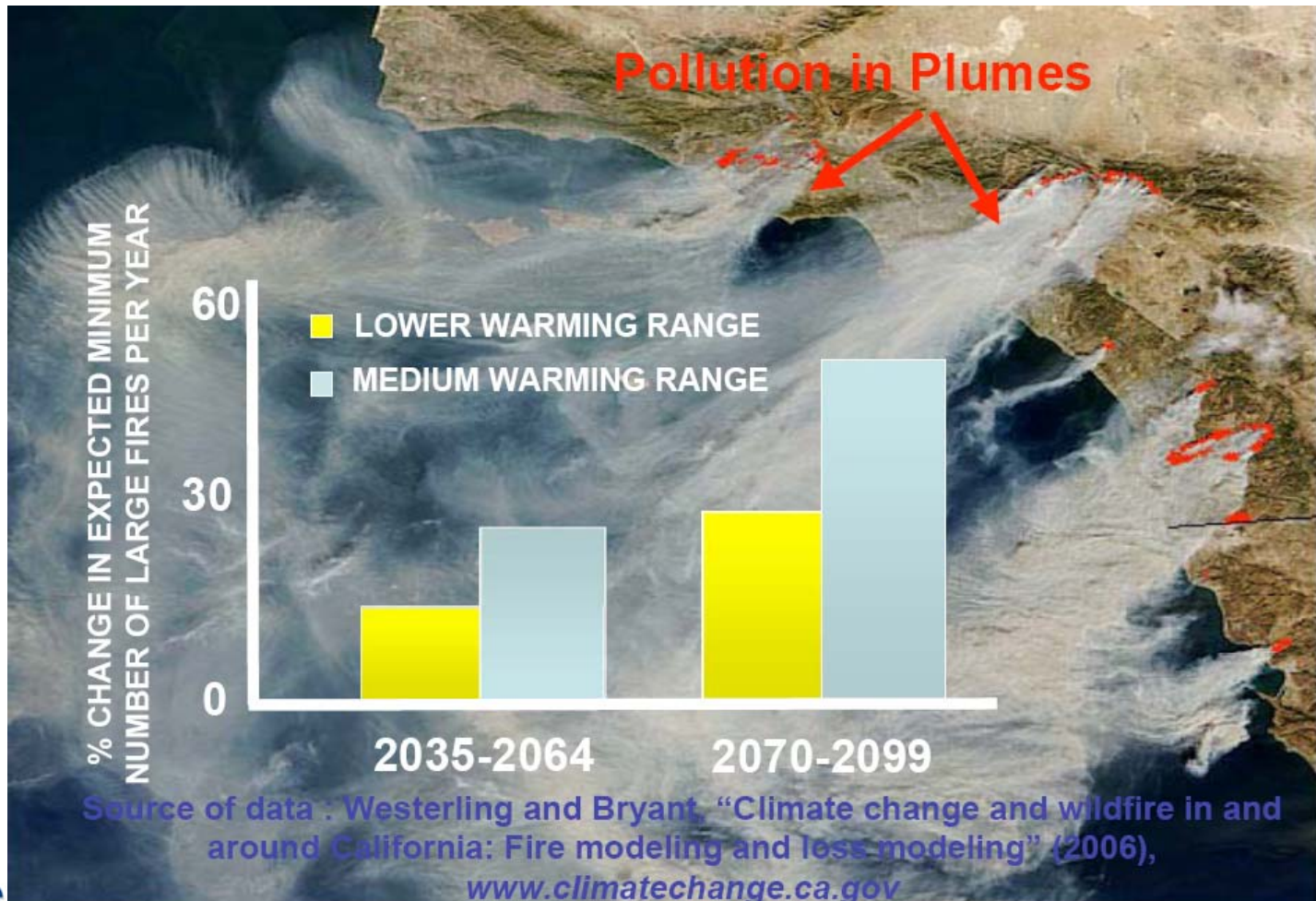
# Ozone Increase is Dependant on Warming Range



Our Changing Climate: Assessing the Risks to California (2006),  
[www.climatechange.ca.gov](http://www.climatechange.ca.gov)

Data from GFDL B1 and A2 runs. SOURCE: Kleeman et al. 2006

# Expected Increases in Wildfires



# Resources and More Information

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- **CARB:** <http://www.arb.ca.gov/cc/cc.htm>
- **IPCC:** <http://www.ipcc.ch/>
- **U.S. EPA:** <http://www.epa.gov/climatechange/index.html>
- **PEW Center:** <http://www.pewclimate.org/>

