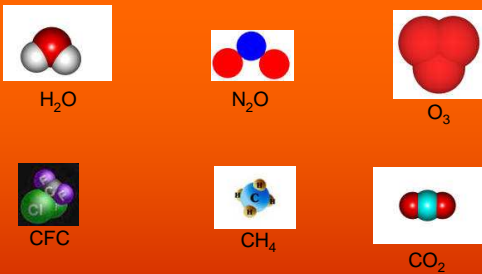


Global Warming

Miller CH19

GREENHOUSE EFFECT

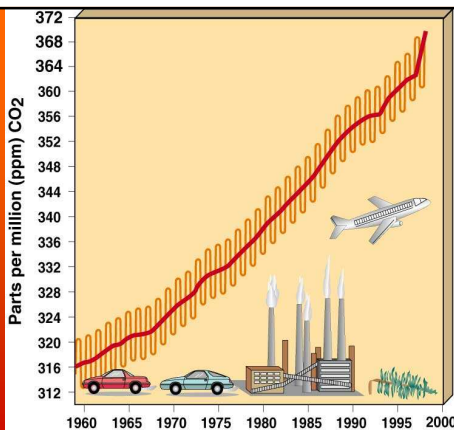
- Natural phenomenon
 - Purpose?
- How does it happen? What's the process?
- Intensity depends upon two factors
 - Concentration of gases
 - Residence time
- What are the major greenhouse gases?



PFC

GLOBAL WARMING

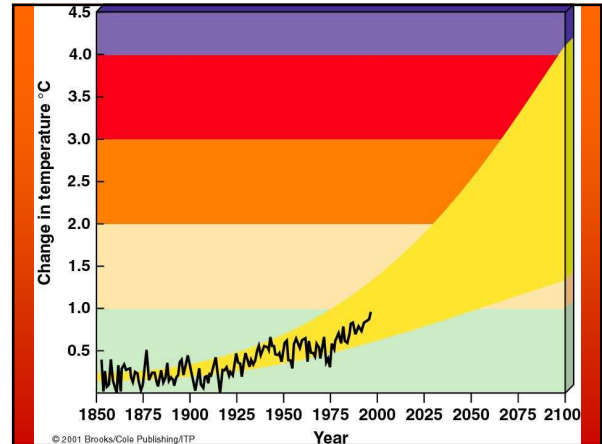
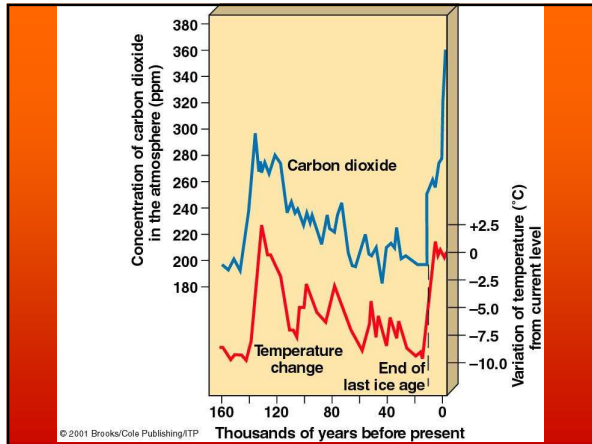
- Enhanced greenhouse effect
- Most important greenhouse gas from human activities is ...
 - Mostly from developed countries (60%)
 - Little from poor/developing countries (40%)
 - Will get worse as countries industrialize
 - United States contributes most at 23%
 - 1860→1997 [CO₂] from 280→364 ppm



GW STUDIES

- Antarctic Ice provides data for thousands of years
 - Ice core samples
 - Natural recorder of temperature
 - Gas bubbles analyzed for CO₂
- GW studies agree that...
 1. H₂O vapor unchanged over 160,000 years
 2. [CO₂] changed with the temperature
 3. 1860> , avg. global temp ↑ 0.3-0.6°C

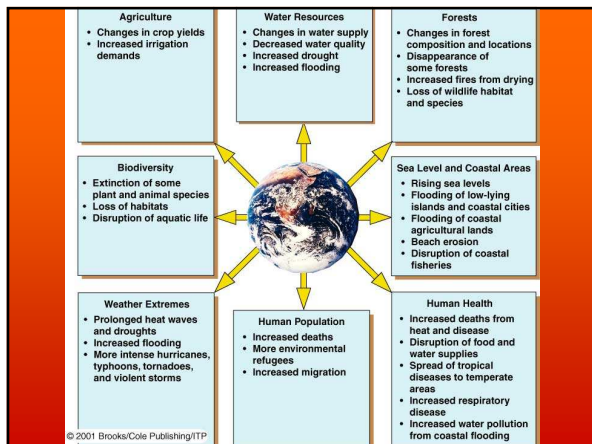
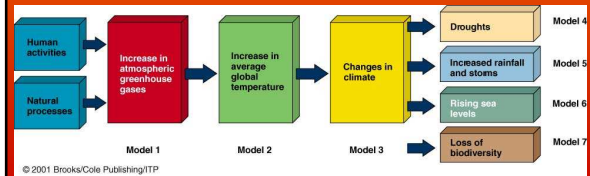




COMPUTER PREDICTIONS

- IPCC uses computer models
- 1. 1990→2100 avg. temp. \uparrow 1-3.5°C
 - \uparrow 2°C most likely if [CO₂] doubles from preindustrial 280 ppm to 560 ppm
- 2. N. Hemis. hit harder than S. Hemisphere
 - WHY?
- 3. \uparrow evaporation = \uparrow in ...
 - Mostly as heavy snow, thunderstorms, floods, etc. (severe weather)
- 4. Sea level rise approx. 19"
 - WHY?

Effects of Global Warming



1. MAJOR CLIMATE CHANGES

Duh!

2. FOOD PRODUCTION SHIFTS

- Increases in some areas, decreases in others
- Project ↓10-70% in global yield
- Bigger problem...
 - PESTS – temp. affects life cycle and distribution
- Cropland floods
- Highly productive areas in ocean destroyed as ↑temp causes ↓biodiversity

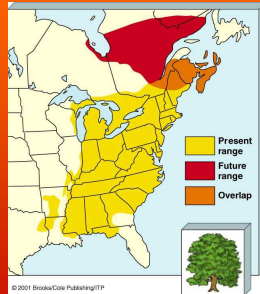


3. WATER SUPPLY

- Some areas see drastic reductions
- Glaciers that provide water retreat

4. FOREST DISTRIBUTION

- Tree populations "move"
 - Some go northward as those areas get warmer
 - Some that can't move fast enough may die out
- Massive wildfires more frequent
 - Increased temps = more droughts
 - Drought produces lots of dry tinderwood



5. BIODIVERSITY . . .

DECREASES

6. SEA LEVELS RISE

- ↑48cm (19") by 2100
- Water expands when heated
- Fisheries at risk – flooding of coastal estuaries & wetlands
- Accelerates erosion
- Contaminates coastal aquifers – saltwater intrusion



7. WEATHER CHANGES

- More extreme
 - More heat = more convection = more clashing air masses/fronts
- Increased intensity & frequency of damaging hurricanes, typhoons, tornadoes, etc.
- Huge economic loss
 - Why?



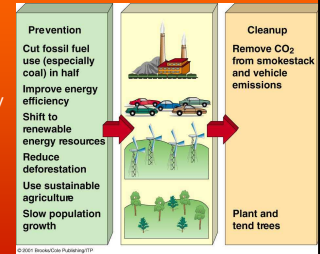
8. HUMAN HEALTH

- More heat waves
- Food and water supplies disrupted
- Increases in fungal skin diseases with higher humidity
- Increased effects of air pollution & smog
- Sewage systems flood with rise in sea level → spreads waterborne disease



What can we do?

- Act NOW
- Reduce CO₂ emissions!
 - Cut fossil fuel use & emissions
 - Increase energy efficiency
 - Reduce deforestation
 - Slow population growth
- Nations work together – global treaties



Kyoto Protocol

- 1997
- 38 developed countries cut greenhouse emissions 5.2% below '90 levels by 2008-2012
- Europe lower emissions 8%
U.S. lower 7%
- Reductions voluntary for developing countries
- Emissions credit trading
- Forested countries get extra credits – trees absorb CO₂
- Penalties for treaty violation

Status of Kyoto Protocol?