Global Warming

• The current round of global warming
• Is there anything unusual here?

Global Warming

• Real Time Monitoring of Temperature and Atmospheric Gases

• Past 15,000 years - global temperatures are rising; greenhouse gas concentration rising.

• But isn’t this natural? That’s the important question!

Trends in CO₂ Concentrations

1958 - measurements near top of Mauna Loa; high altitude, far from sources of atmospheric pollution.

Concentrations fluctuate regularly throughout year and seasonally.

1958 - 315,000 ppbv
2000 - 355,000 ppbv

Increase in CO₂ raises two questions...

• Is the observed rise in CO₂ unusual?
• How can it be explained?
**Ice Core Records**

- **Antarctica** - 160,000 yrs
- **Show:**
  - During glacial periods:
    - 200,000 pptv
  - During interglacials:
    - Pre-industrial: 280,000 pptv
    - Last 200 yrs - rapid increase to 355,000!
- Unprecedented in ice record.
- Implies something unusual

**Possible Explanations**

- No known natural mechanism can explain the rapid increase.
- Anthropogenic mechanism? The rate at which CO₂ is added to atmosphere since the beginning of the Industrial Revolution.
- (The curve tracking increase in CO₂ resembles the curve showing the increase in CO₂ emission by burning of fossil fuels!)
- Possible conclusion: fossil fuels must be primary reason for increase.

**Contributing Factors**

Deforestation

Main source of fuel in rapidly growing developing nations: wood!

**Modeling Global Warming**

Global Climate Models - mathematical models of climate systems.

Greatly oversimplified; climate system is complex and poorly understood.

Present models do not portray dynamics of ocean circulation or cloud formation.
GCM Predictions

1°C warmer by 2025
Maybe 6°C warmer by 2040!

So What?
- Won't we be able to enjoy the warmer temperatures??

Maybe Not!
- Potential Effects of Global Warming
  - Climate Patterns
    - Change in rainfall patterns and soil-moisture relationships; important to agriculture and food supply.
    - Climatic growing zones displaced north because lack of appropriate soil conditions.
    - Loss of ecosystems and biodiversity
  - Violent Storms
    - Warming oceans feed more energy into high magnitude storms (hurricanes).
    - Increased hazards of living in low-lying coastal areas.
  - Rise of Sea Level
    - Increased coastal erosion of beaches
    - Increased sensitivity to high-magnitude storms
    - Displaced populations

Can we wait to find out? Or should we start preparing/acting now?