## ES10 Greenhouse Warming January 25 2002 Inez Fung

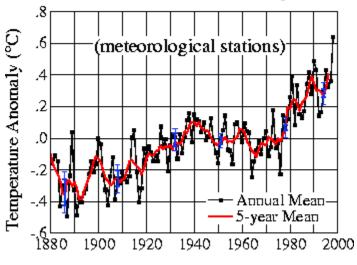
## 1. Observations:

- a. Climate has been warming in the past 200 years;
- b. Atmospheric CO2 and other greenhouse gases have been increasing since the preindustrial revolution 200 years ago;
- c. atmospheric CO2 increase is about half of emissions from fossil fuel combustion land and oceans have absorbed the remainder.

 $\Delta CO_2 = \text{sources} - \text{sinks}$ .

- 2. Theory: CO2 is a greenhouse gas
- 3. Hypothesis: Warming is due to increasing CO2 concentration
- 4. Counter-hypothesis: the warming can be part of natural oscillations in climate
- 5. Policy: United Nations Climate Convention 1992; Kyoto Protocol 1997: reduce CO2 emissions 2008-2012 from 1990 levels. US: 7% reduction. Ambiguity which emission? Gross emission (like fossil fuel burning, right hand side of equation) or net emission (left hand side of equation, like after the land and ocean uptake)?
- 6. Bush: "Kyoto Protocol is fatally flawed".
- 7. May 2001: National Academy Report in response to questions from the White House: "Climate Change Science: An Analysis of Some Key Questions" warming "observed over the last several decades are <u>likely mostly</u> due to human activities, but we cannot rule out that some significant part of these changes are also a reflection of natural variability. Human-induced warming and associated sea level rises are expected to continue through the 21<sup>st</sup> century."
- 8. June 2001: Bush Rose Garden Speech: greenhouse warming is a serious problem.
- 9. Scientific challenge: what are the mechanisms that ecosystems and oceans absorb CO<sub>2</sub> from the atmosphere? How will these mechanisms change with climate?
- 10. Policy challenge: how to factor the environment into decisions about economy, unemployment, trade, ...

## Global Mean Surface Air Temperature



## Year

