

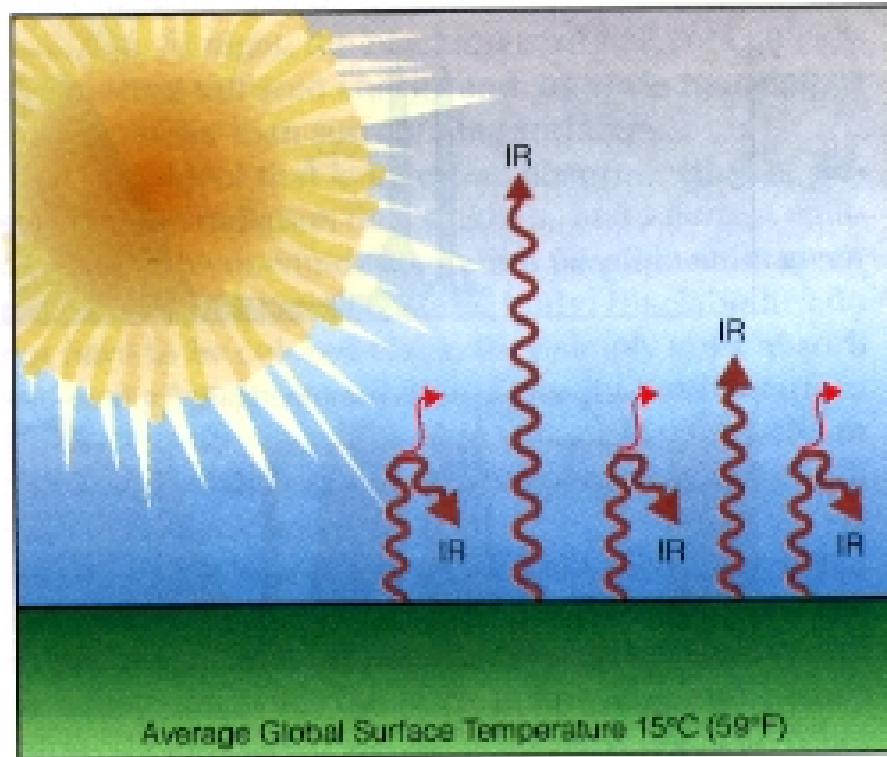
Lecture 36 Anthropogenic Effects on Climate

It is well-documented that globally averaged land and sea-surface temperatures have increased 0.5 C in the last century. Is this the beginning of man-made global warming?

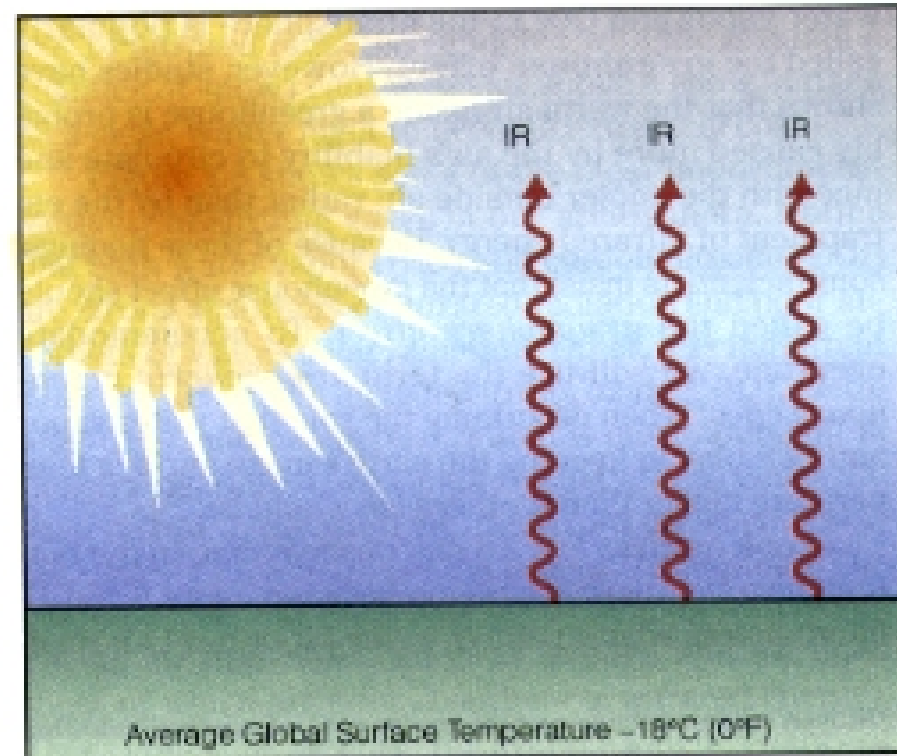
Two major anthropogenic ‘forcings’ on global climate have been identified.

1. Greenhouse gas concentrations are increasing
2. Aerosol concentrations are increasing

The greenhouse effect



(a) Earth's atmosphere with H_2O and CO_2



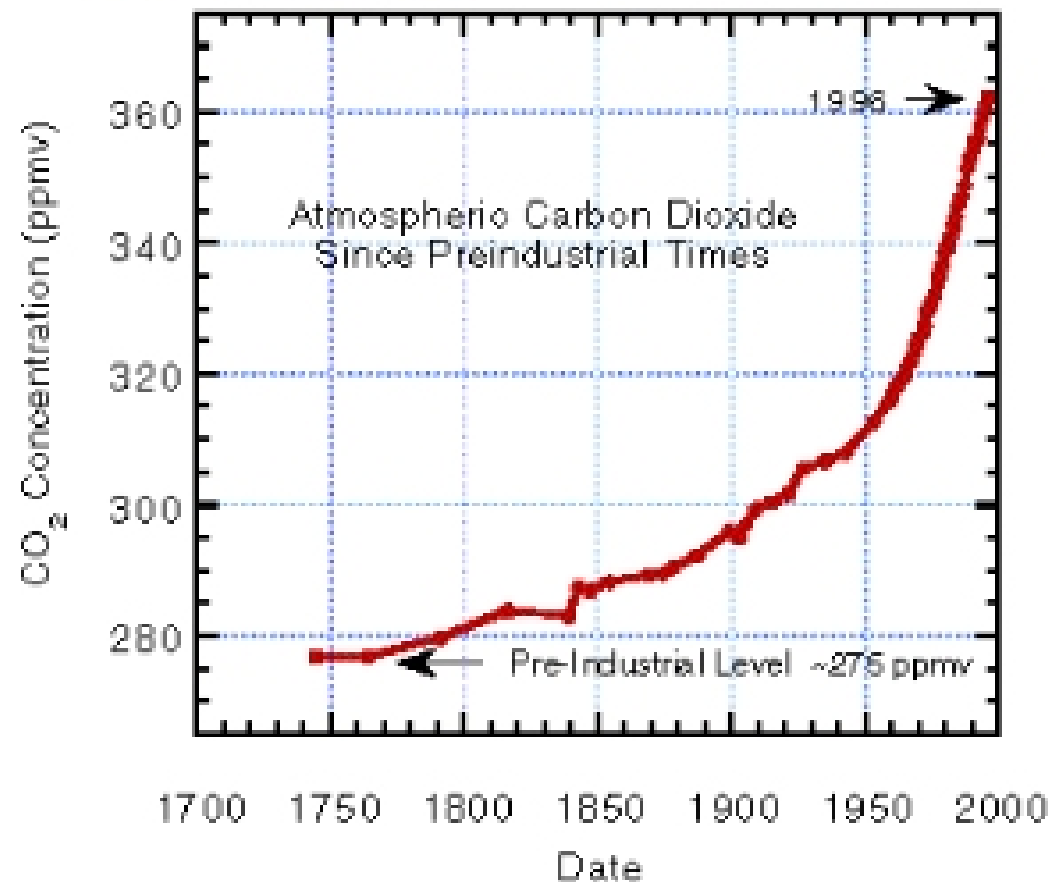
(b) Earth's atmosphere without H_2O and CO_2

EOM 2.10

- If the earth's atmosphere were dry, we could predict fairly confidently that doubling pre-industrial CO_2 (likely by 2100) would increase mean surface temperature about 2 C.
- The famous 19th century Swedish chemist Arrhenius was the first to predict greenhouse warming.

Greenhouse gas concentrations are increasing

Hartmann, fig 8.6



- Currently, 7 gigatons/yr of CO₂ produced by burning of fossil fuel (80%) and deforestation 20%).
- Half accumulates in atmosphere, where it has a residence time of 50+ years.
- If we totally stopped burning fossil fuels/forests, it would take 50 years for CO₂ to return half way to preindustrial levels.