

Principles of Astrophysics Physics 342

Spring 2003

HOMEWORK ASSIGNMENT #2

Due Thursday Feb 6, 2003 4:30PM

(1) For atmospheric CO₂ concentrations not too different from the present value, the radiative forcing of CO₂ can be expressed by the formula

$$\Delta F = -6.3 \times 10^3 \ln \left(\frac{C}{C_0} \right),$$

where $C_0 = 300$ ppm is the CO₂ concentration near the turn of the 20th century, C is the CO₂ concentration at some other time, and ΔF is the change (in ergs s⁻¹ cm⁻²) in the outgoing infrared flux caused by the change in CO₂ concentration.

- (a) By how much would the outgoing infrared flux decrease if the atmospheric CO₂ concentration were increased from 300 ppm to 600 ppm?
 - (b) By how much would surface temperature have to increase in order to bring the radiation budget back into balance in part (a), assuming that the planetary albedo and the amount of water vapor in the atmosphere do not change?
- (2) C&O, page 779, problem 18.13
- (3) C&O, page 818, problem 19.9