Homework #4
Handed out November 16, 2010
Due November 30, 2009

Read Chapters 4, 5 and 8.

1) If the solar coronal atmosphere is 10^6 K, what is the proton thermal energy in eV?

2) What is the kinetic energy (in eV) of solar wind protons at 1 AU?

3) Use Chapman's static model of the solar corona to estimate the coronal temperature and density at a 1 AU. Assume $T_0 = 10^6$ K, and $n_0 = 10^{14}$ m^{-3}.

4) How much mass is lost by the Sun per unit time owing to the solar wind? Assume that $n = 10^7$ m^{-3} at 1AU. How long would it take to deplete the Sun through loss by solar wind?

5) Estimate the intensity of the IMF at 1 AU if the Sun were immersed in a vacuum and the solar magnetic field could be approximated as a dipole.
415 students: Compare this to the known magnetic field strength from satellite observations.
515 students: Compare this to the model developed in class. Use the fact that the coronal magnetic intensity is 10^{-4} T and the solar wind velocity beyond the critical radius, r_c, is 400 km/s. The average period of rotation of the Sun is 27 days.

Short writing assignment

Rewrite the Autumn Aurora article so that it is both scientifically accurate and accessible to the general public. To fix the figure you can either redraw one that is correct or use one you find on the web. If you use one you find on the web, cite where you got it from. Also make sure the figure is actually accurate.