4   The Earth's magnetosphere

Reading

"The Exploration of the Earth's magnetosphere," by David Stern, sections 4, 19, 20, 23

Problems

1. What is the strength of the Earth's dipole magnetic field at geosynchronous orbit? (The strength at the Earth's surface on the equator is 30 μT.)

2. Estimate the location of the magnetopause at the subsolar point (a point directly between the Earth and the Sun). Use the fact that the solar wind pressure (ρv^2) must balance the "magnetic pressure" ($B^2/2\mu_0$) of the Earth's dipole magnetic field. Here, $\mu_0 = 4\pi \times 10^{-7}$ N A^{-2} is the "permeability of free space," and is a fundamental constant that denotes the strength of magnetic fields.

3. Where is the center of mass of the Earth-Moon system?

Report

Write a 3-4 page report (typed, double-spaced, 12-point font, 1-inch margins) on some aspect of the solar-terrestrial interaction. Some suggestions are (but you are not limited to):

- aurora

- radiation belts (Van Allen belts)

- ionosphere

- magnetotail

- magnetic storms

    This report must be specific. That is, rather than being descriptive, I would like you to try to be quantitative. You now know how to calculate many things, so make sure you calculate something relevant to your report's topic.

    You must email me your title, and a one paragraph "abstract," by Monday, August 9, 2009 at 5pm. The abstract should be 3-7 sentences, describing your planned report topic. Include this abstract as a short, single-spaced paragraph at the beginning of your report.

    As usual, you must quote your references. In addition to online sources (give the name of the page, the URL, and the date accessed), you must have at least one book reference from the ERAU library (give the title, author, publisher and date of publication, as well as the call number).

Due Dates

- Thu 8/5 — Problem 1
- Tue 8/10 — Problem 2
- Wed 8/11 — Problem 3
- Thu 8/12 — Report