11:670:451 / 16:712:552 Remote Sensing of the Ocean and Atmosphere

Homework 2

Due Monday February 13, 2006

1. In class it was shown that balancing centripetal force and gravitational force leads to an equation describing the proportionality of orbital period squared (T^2) to orbital radius cubed (r^3). Use the equation derived in class to calculate the distance from the Sun to the Earth. Work in SI units. Refer to your notes for the value of the gravitational constant, G. You can use google.com to find the mass of the Sun, and to check your answer.

2. The NOAA-15 meteorological satellite that produces high-resolution imagery of sea surface temperature, vegetation index, clouds, and other data, is in an orbit with inclination 98.7° and altitude 833 km.

    a. What is the maximum latitude of the satellite ground-track?

    b. Calculate the orbital period.

    c. Calculate the orbital speed.

    d. What name is given to this class of orbit?

3. See a satellite with your own eyes. (The Moon does not count).

    Use the website http://heavens-above.com to generate a star chart and table of pass details for any satellite of your choice. You can choose to register as a user, or enter as an anonymous user and find your location in the data base. Or you can jump straight to information for New Brunswick, New Jersey, at the following shortcut I've created http://tinyurl.com/d563w

    Pass predictions are given for the International Space Station, Envisat, the Hubble Space Telescope, and many many other satellites. Depending on the weather and your preference for staying up late or getting out of bed early, choose a bright satellite pass to try to view. The smaller the magnitude the brighter the object. When you click on the **Time** entry for the pass you'll get a star chart for the pass trajectory which will help you locate the object in the sky at the right time.

    a. Which satellite did you see? Describe briefly what the satellite is built for.

    b. What date and time did you view it?

    c. Was it an ascending or descending pass?

    d. The satellite was visible only for part of the arc across the sky. Why?