HOMEWORK #7 (due start of class Feb 3)

LEARNING GOALS:

1. Continue recording observations in your journal.
2. Understand the cause (s) of seasonal effects at different places on Earth.
3. Prepare to observe eclipses of the star Algol this week.

TO RECEIVE FULL CREDIT:

1. If you submit multiple pages, staple them together.
2. To receive any credit on these problems, you must **show how** you derived your answer by writing all the logical steps that led you to it.
3. All sentence responses must be **typewritten and in complete sentences**. You may handwrite any arithmetic. Use good English grammar.
4. **If you work more than three hours on this assignment, you should stop, record your work here, and contact Dr. McCarthy.**

---

1. Build your Solar Motion Demonstrator (SMD) and bring to Friday's class.

Follow the directions given in class and the instructions described below:
http://static.nsta.org/extras/pbl-earth-space/SolarMotionDemonstratorInstructions.pdf

2. Keep observing the sky (day & night) and record notes, pictures, and measurements in your journal.

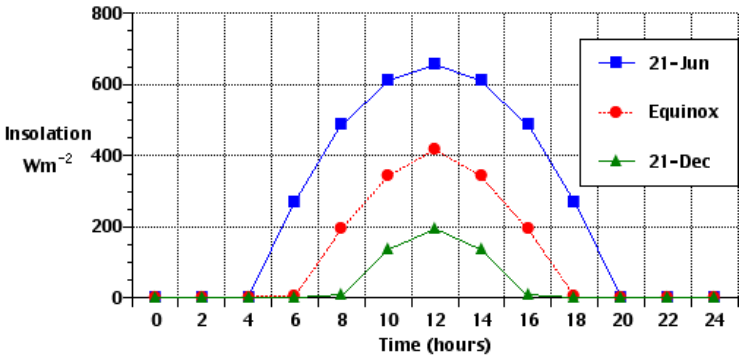
Dr. McCarthy has **posted a new link, describing journal content and requirements**, on our Web site. Stay up-to-date!

You will turn in your journal on Monday (Feb 10) for initial critique and grading.

3. Read about "seasons" in Chapter 4.2 in our online textbook at the following link.

Be sure to understand how the Earth's tilted rotation axis causes two effects that cause seasons on our planet: (a) changes in concentration of sunlight on the Earth's surface and (b) changes in the length of daytime.

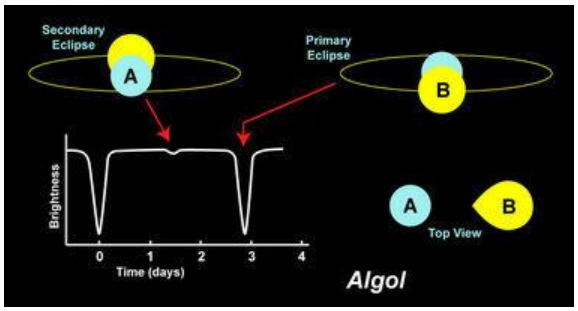
The following diagram displays the amount of energy reaching the surface of Minneapolis, MN, at different times of day at the solstices (summer, winter) and the equinoxes. Using quantitative information from the diagram, describe how the two effects listed above combine to create seasonal variations in the amount of sunlight hitting the surface.

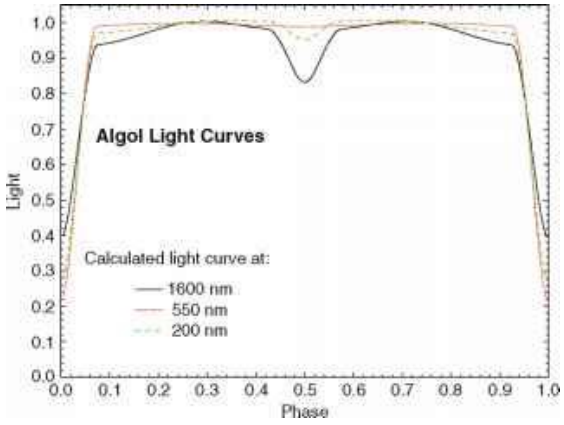


4. Prepare to observe the binary star Algol (m_v=2.1) by first locating it in the night sky.

Algol consists of two "unresolved" stars orbiting each other every 2.867328 days. This week you can see the stars eclipse and reach a minimum magnitude (m_v=3.4). The dimming process lasts ~5 hours, as does the subsequent brightening. Algol will reach its minimum magnitude at these times: Feb 3 (1:31 am); Feb 5 (10:21 pm); Feb 8 (7:10 pm).

As illustrated below, the Earth lies in the orbital plane of these stars, so we regularly see the two stars eclipse as they take turns moving in front of each other. The diagrams below illustrate this process as well as the variation in brightness (flux) vs time over one full cycle. Convert that variation in flux to a variation in magnitude.


Secondary Eclipse
A
Primary Eclipse
B
Brightness
0
1
2
3
4
Time (days)
A
B
Top View
Algol


Algol Light Curves
Calculated light curve at:
1600 nm
550 nm
200 nm
Light
Phase
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0