Solar Rotation Speed Project

Warning: You MUST Have a Special Solar Filter for this Project

Observing Projects: Solar Rotation

Objective

Track the motion of sunspots over the course of the three months. You will record:

1. the solar latitudes and longitudes of various sunspot groups
2. the times and dates of your measurements

Equipment/Technique

You will use the specially equipped solar observing equipment. DO NOT LOOK AT THE SUN DIRECTLY. YOU MUST HAVE A SPECIAL "SOLAR FILTER" PROPERLY INSTALLED ON A TELESCOPE TO ACCOMPLISH THIS PROJECT.

You will project an image of the Sun onto a map of its surface, and simply record the locations of any visible sunspots. Colored pencils help you keep track of groups from day to day. A record of the varying latitude and longitude of a spot with time yields the rotation rate of the Sun. Picking the proper map and how to align it will be the true challenges.

The best advice is to be consistent throughout the three months. The Sun rotates once in about a month, so a spot group will come and go in just a couple weeks. Recording them as consistently as possible so you can recognize the same group day to day is important. Organize the observing however you wish, it just can't be too early or late in the day. Contact your local astronomy club any time to discuss problems or questions.

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This is a great time for this project because the Sun is near its maximum activity right now and so has lots of spots.

Analysis
You will:

1. estimate the angular speed of sunspot groups
2. correlate their speed with latitude
3. estimate the average rotation rate of the Sun

You should analyze each spot separately. Plot the spot's solar longitude as a function of time. Its speed is the slope of that line (degrees/day). You get the Sun's rotation rate, T, simply from

$$360^{o}/T = \text{spot speed} \quad .$$

To see differential rotation, you should plot spot speed versus latitude.

Be sure to put all of your data into tables and/or graphs and include some of your maps in the report. Estimating errors will be difficult. I suspect aligning the map will be the hardest part, but try to estimate how far off you could be in spot speed, say, if you messed up the map that day by a few degrees. Comparing individual spot plots will likely show inconsistent days. You may decide how best to use them (or to discard them).

Sheet Number _____

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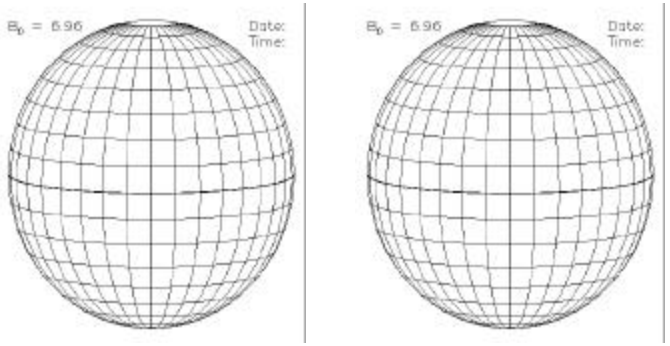
Make copies of this blank sheet as necessary



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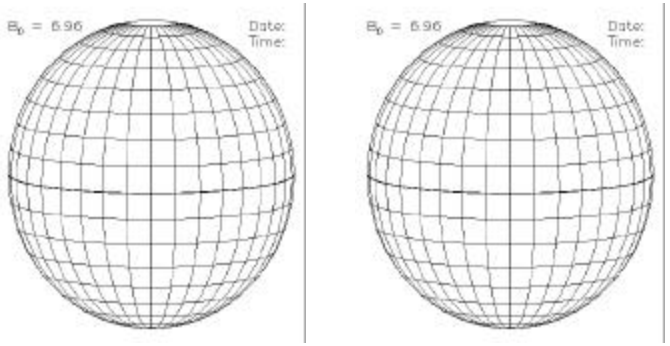

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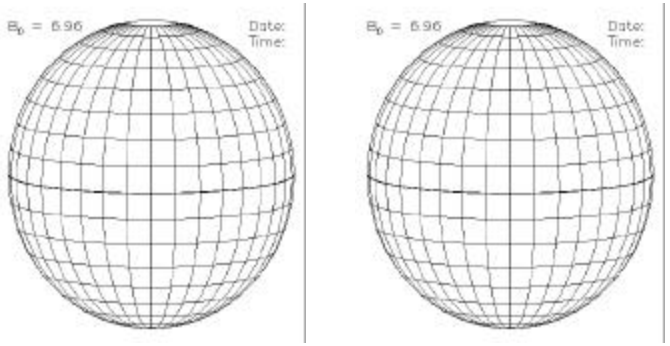

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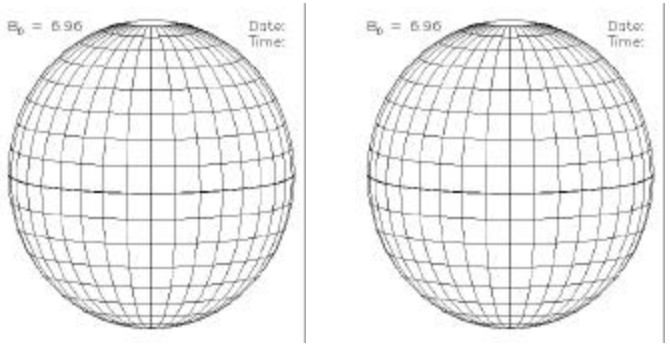

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