XVII...Investigating Magnetic Storms

Introduction:

Every three hours throughout the day, magnetic observatories around the world measure the largest magnetic change that their instruments recorded during this time. The result is averaged together with those of the other observatories to produce an index that tells scientists how disturbed the earths magnetic field was on a 9-point scale. This scale is called the Kp scale. The larger the index (9+) the more active the earth was. The smaller the index (1-2) the more quiet it is. Sometimes changes in the suns activity can cause big changes in Kp. At other times, large Kp values can indicate sudden rearrangements of the earths field due to the solar wind. When Kp is above 6 or 7, satellite problems, blackouts or equipment interferrence often occurs.

Objective:

Students will use an internet archive of Kp indices to study how frequent magnetic storms of different severities are during the year, and during the solar 'sunspot' cycle.

Procedure:

1) Visit the archive of the NOAA Kp bar charts for 2000-present at:

http://www.sec.noaa.gov/ftpmenu/plots/kp.html

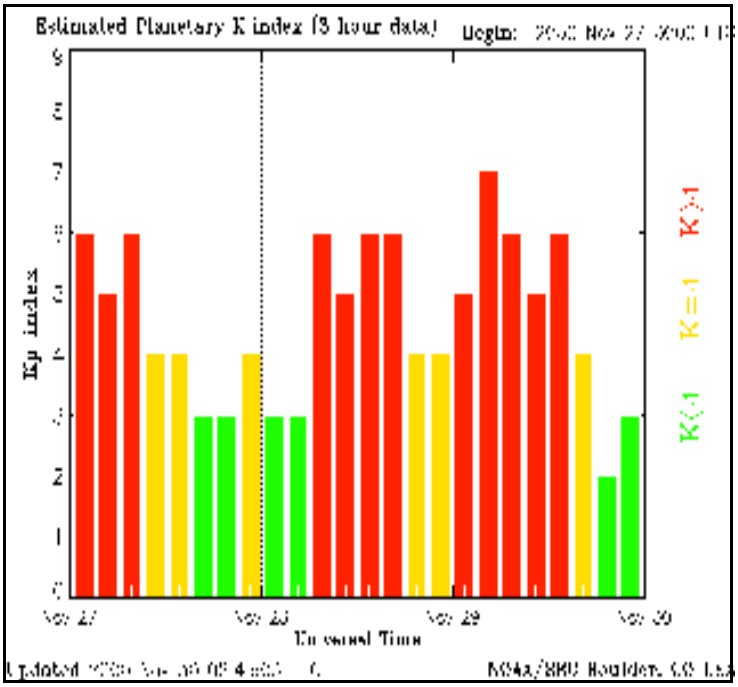
A sample of the 3-day plots is shown in Figure 1 and was listed as file 20001129_kp.gi in their FTP archive.

2) Select a range of data spanning a week, a month, 6 months, or a year.

3) For each of the Kp bar graphs, count the number of times that Kp equaled 4, 5, 6,7, 8 and 9. *The figure, for example, shows 7 times when Kp = 6.*

4) Construct a bar graph that plots the Kp value on the horizontal axis and the number of events on the vertical axis.

5) Answer the accompanying questions.



Questions:

1) What is the most common level of activity for the Earth's magnetic field at ground level?

2)How long would you have to wait, on average, for a very severe storm with Kp > 8?

3) How long would you have to wait, on average, for a moderate storm with Kp = 7.

4) How frequent are magnetic storms with Kp = 8 or stronger compared to storms with Kp = 6?