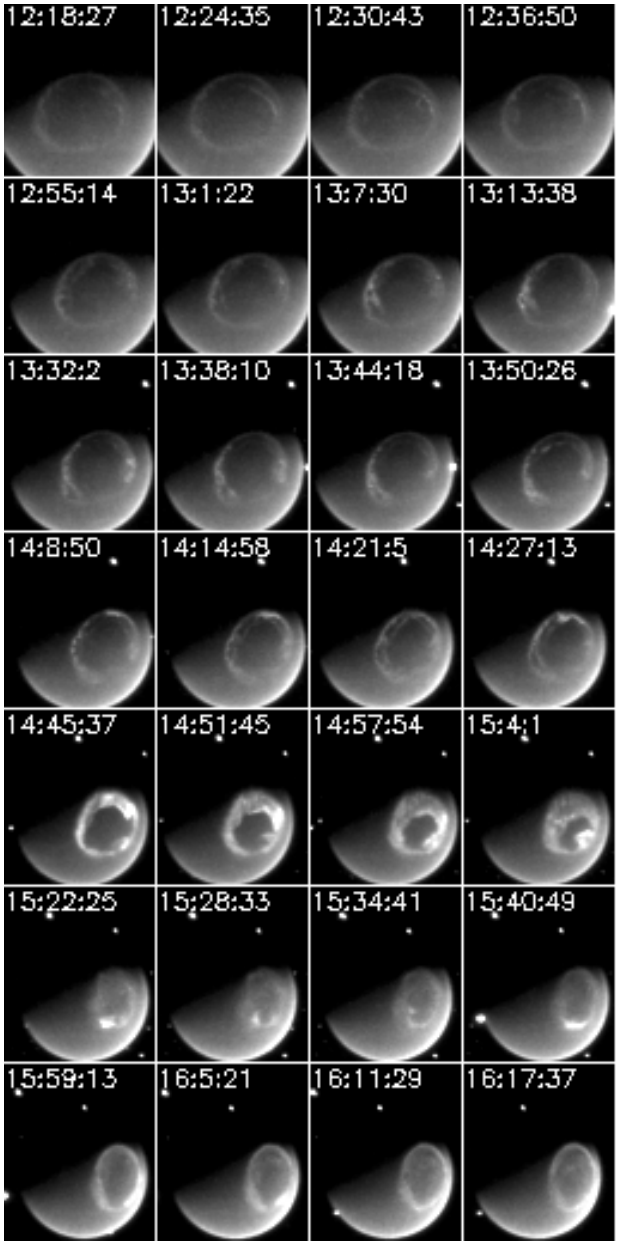
XXI...The Evolution of an Aurora in Time

Introduction:

It has been known since the 1800's that auroras do not change randomly in time, but follow a very specific pattern of changes during the course of a night's observation. The reason for this sequence of changes has to do with the way that the magnetotail of the earth is changing as it tries to release its stored energy and tangled magnetic fields.

Objective:

In this activity, we will use data from the IMAGE satellite to study how the shape of the auroral oval changes during the course of a magnetic storm. An online archive of 5-minute satellite views will be used. We will select several storms from the archive and sort out the images in time to look for a common pattern of changes in the shape of the oval.



Conclusions and Outcomes:

The students will study real auroral images from the IMAGE satellite and search for a pattern in time of how auroras change.

Students will learn how to use web-based data archives, extract the data they need to study a specific question, and organize the data to draw a conclusion.

Students will study two or more magnetic storms from space data, construct a timeline of changes, and compare the storms for common elements.

Procedure:

1) Visit the IMAGE, Far Ultraviolet Camera web site archive at:

http://sprg.ssl.berkeley.edu/sprite/ago96/image/wic_summary/

2) You may either search the archive to find candidates to study, or select one of the dates below which contained a strong magnetic storm event an prominent oval.

Storm Dates: November 29-31, 2000, July 14-16, 2000, June 7-10, 2000. May 223-26, 2000.

3) Click on the archive for the month and year of interest. Example NOV_2000/

4) Convert the calendar date you are interested in, into a day number for that year. Example, November 29, 2000 = day 334. [Remember to add a day for Leap Year]

5) Click on the file for the day of interest. Example: WIC_2000_333_02.gif is for the 333 day of the year 2000, and it is the second archive (02) of images for that day. You will see a panel of images obtained by the FUV instrument. There may be several files to look at for that date.

6) Print out the relevant panels that show the auroral oval.

7) Clip out the individual auroral oval images being careful to note their time mark in the upper left corner. You will use this time mark to order the picture tiles in time order.

8) On a piece of paper, order the tiles in time order, making sure to include several tiles at the beginning and end that show little or no activity to establish a baseline for discussing the changes.

9) Compare the 'movie strip' in Step 6 for at least two or three different storm events.

10) On a table that gives the elapsed time from the start of the storm (the first picture in your movie will be defined as Time 0:0:0) in column 1, write an annotated description in columns 2, 3 ... of what changes were seen in the oval. Some of the things you should note are, for example:

1...When did the oval reach its maximum extension towards the equator?
2....When did the oval reach its maximum extension poleward?
3...When did the oval reach its brightest point?
4....When was the oval the thickest?
5....When did the oval show the most complex interior structure?
6....When did the oval show its narrowest thickness?
7....When did the oval begin to fade out?