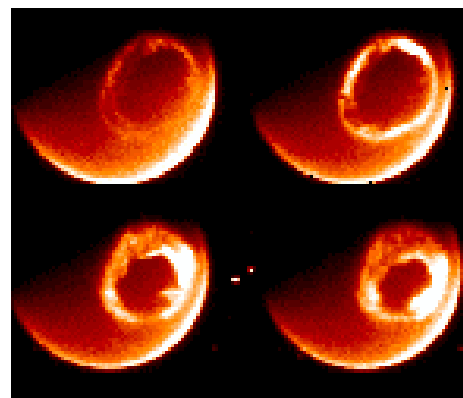
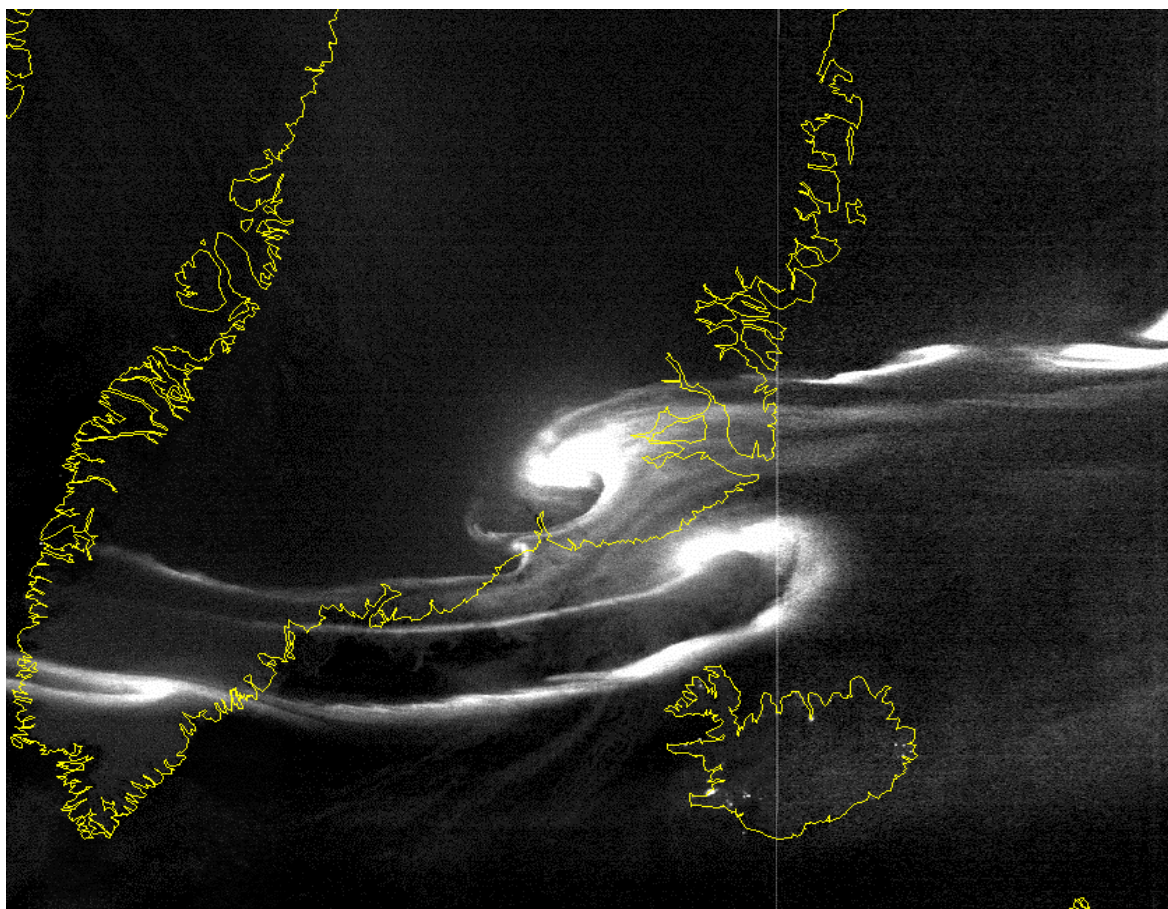


THE NORTHERN LIGHTS



A Grade 7-8 guide to understanding the Aurora Borealis through math, geometry and reading activities.

This series of activities will help students understand how the Northern Lights work, what causes them, and how to observe them.

Through a series of math and reading activities, students will learn:

How aurora are described by scientists and by other students
(Reading)

The geographic locations of aurora based on satellite data
(Geography)

How aurora appear in the sky at different geographic latitudes (Geometry)

The height of aurora above the ground (Geometry - parallax)

How to predict when they will appear (Mathematics)

What Norse Mythology had to say about aurora (symbolic code translation)

This booklet was created by the NASA, IMAGE satellite program's Education and Public Outreach Project.

Writers:

Dr. Sten Odenwald (*NASA/IMAGE*)

Ms. Susan Higley (*Cherry Hill School*)

Mr. Bill Pine (*Chaffey High School*)

Students:

Emily Clermont (*Holy Redeemer School*)

Denali Foldager (*Seward Elementary School*)

Sonta Hamilton (*Mt. Edgecumbe High School*)



For more classroom activities about aurora and space weather, visit the IMAGE website at:

<http://image.gsfc.nasa.gov/poetry>

The cover shows a view from the NPOESS satellite looking down at an aurora over Greenland. (http://npoesslib.ipa.noaa.gov/S_sess.htm). Viking rune inscription (<http://www.commersen.se/vikingar/vardag/runor.html>). The three smaller images at the bottom of the page are: (Left) an aurora borealis viewed from the Space Shuttle; (middle) portion of the auroral oval over North America viewed by the DMSP satellite showing city lights; (right) the auroral oval viewed over the Arctic region on July 15, 2000 by the IMAGE satellite.





As this image from the IMAGE satellite shows, from space, the aurora look like rings of light surrounding the North and South Poles. This activity has students plot the location and boundaries of a typical auroral 'oval' in the Arctic region. They will see its geographic extent, and determine its relationship to familiar continents and countries. They will also see that it is centered on the North Magnetic Pole and not on the North Geographic Pole. This is a clue that Aurora are related to Earth's magnetic field.

Math and Science Objectives:

Find and describe locations on maps using geographic coordinates.

Graphs can be used to show a variety of possible relationships.

Graphs can be used to make predictions about the phenomena being graphed

Sample questions:

1...Where would you travel in North America to see aurora? **Answer: To Canada or Alaska**

2...About where is the center of the auroral oval located? **Answer : +78 North 104 West**

3...How far is the center of the auroral oval from the North Pole? **Answer: About 500 km.**

4...What is the range of widths of the auroral oval in kilometers? **Answer: From about 500 to 1500 km.**

5...If you were located at (100, 68) where would you look in the sky for the aurora? **Answer: Straight up!**

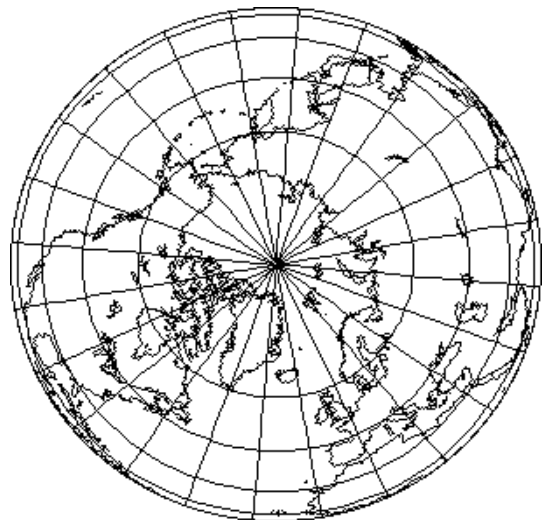
6...If you were located at (100,40) where would you see the aurora in the sky? **Answer: Northern horizon.**

Materials:

Ruler / Straight edge

Color pencils

Atlas



Student Name _____ Date _____

The Northern Lights are seen most dramatically in only certain places in North America.

- Step 1) Plot the points in the satellite data table onto the geographic grid.
- Step 2) Connect the points in the two rings which define the auroral oval boundaries.
- Step 3) Color the resulting enclosed area with your favorite auroral colors!
- Step 4) Identify the visible landforms.

Note: The points are identified as ordered pairs: (Longitude, Latitude)

<u>Outer Ring of Auroral Oval:</u>					
1...(270,65)	2...(225,64)	3...(180,60)	4...(135,55)	5...(90,50)	6...(315,63)
7...(0,60)	8...(40,63)	9...(45,60)	10...(60,60)	11...(115,50)	12...(160,58)
<u>Inner Ring of Auroral Oval:</u>					
1...(270,78)	2...(225,72)	3...(180,70)	4...(135,67)	5...(90,65)	6...(315,67)
7...(0,75)	8...(40,72)	9...(45,70)	10...(60,67)	11...(115,62)	12...(160,70)

