

# Activity 6: Aurora Ovals

Time: 1 class period (1 class period = 45 min)

## Materials:

- Computer or tablet with Internet access
- Aurora Ovals and Glowing Gases multimedia activity--available online at: [culturalconnections.gi.alaska.edu](http://culturalconnections.gi.alaska.edu) or on the Cultural Connections USB flash drive provided with the activity kit
- Aurora Ovals worksheet

## Standards Addressed:

- NGSS: DCI: ESS2.A: Earth's Materials and Systems
- Alaska Cultural Standards: B.1
- Iñupiat Learning Framework: [B]E.e.3.2
- Iñupiaq Cultural Values: Respect for Nature
- Alaska Science Content Standards: B.2

## Background Information:

Earth is surrounded by a powerful magnetic field. The field acts as a buffer, protecting Earth from most of the charged particles the solar wind carries by deflecting the wind around Earth. Some of the charged particles get caught in Earth's magnetic field. They travel along the magnetic field lines to enter Earth's atmosphere near the poles. The charged particles slam into and energize gas particles in Earth's atmosphere, causing them to glow like a neon sign. This creates the northern lights (aurora). The aurora forms ovals around Earth's geomagnetic north and south poles. The oval forms a boundary between Earth's open and closed magnetic field lines. The aurora oval glows during the day and at night, but Alaskans can only see it when Alaska is under the oval and the night skies are clear. Storms on the sun send more charged particles hurtling toward Earth. The solar wind bombards and distorts Earth's magnetic field. The size of the oval changes as the magnetic field fluctuates.

## Assessments:

- Student responses on Aurora Ovals Worksheet provide a means of assessing student ability to:
  - acquire insights about the northern lights from another culture or perspective;
  - accurately diagram where aurora ovals form;
  - understand that the aurora is the result of energy transferred from the sun via the particles carried by the solar wind.
- Class discussion will provide a means of assessing student ability to:
  - reflect on recent weather and environmental conditions.

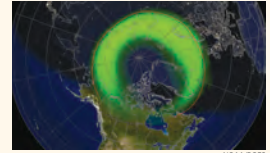
## Activity Preparation:

1. Optional: The elementary Learning through Cultural Connections: Northern Lights kit includes gas tubes and a power supply to help illustrate how the northern lights are similar to a neon sign. If you would like to demonstrate this in association with this aurora ovals activity, please borrow the power supply and gas tubes from your local elementary school.

### Aurora Ovals

*Iñupiaq value: Respect for Nature*

Visit [culturalconnections.gi.alaska.edu](http://culturalconnections.gi.alaska.edu) (Multimedia) to learn more about why the aurora forms an oval over Earth's geomagnetic north pole.



### Activity Instructions:

2. Ask students if they have seen the northern lights recently. Remind students that the northern lights also are known as the aurora, or in Iñupiaq *kiuḡuyat*<sup>NS</sup>/*kiuḡiyaq*<sup>NP</sup>. Discuss student observations of the northern lights.
3. Ask students to partner-read or group-read page 10 of the *Kiuḡuyat*<sup>NS</sup> / *Kiuḡiyaq*<sup>NP</sup> Middle School Guide. *Note: Two versions are provided, for North Slope Iñupiaq and Northern Seward Peninsula Iñupiaq.* Explain that the northern lights form an oval-shaped crown above Earth. Explain that this crown is visible from space as well as from the ground. If Internet connectivity allows, show the NASA UHD Video: Stunning Aurora Borealis from Space in Ultra-High Definition (4K). This video is available on YouTube.
4. Use a Smartboard as a class, or ask students to try the Aurora Ovals multimedia activity at [culturalconnections.gi.alaska.edu](http://culturalconnections.gi.alaska.edu) or on the Cultural Connections USB flash drive provided with the activity kit to learn about why the aurora forms an oval over Earth's geomagnetic north pole. Revisit the Magnet Earth multimedia or video animation and the Glowing Gases multimedia as needed to review the processes leading up to the formation of the aurora and how different gases produce different colors of aurora.
5. Discuss: How does what you have learned about aurora ovals explain why people living near Earth's equator very rarely see the aurora, while those who live in the far north can see it often?
6. Distribute the Aurora Ovals worksheet and ask students to complete it using what they learn from the multimedia activity.

### Connections and Extensions:

- Model it! Cut an oval ring out of green paper. Using a globe, center the oval over the geomagnetic north pole. Identify an object in the classroom to serve as the “sun” and rotate the globe, challenging students to identify times when the northern lights are visible from their area. Hint: the oval must be over Alaska and it must be night time—Alaska must be facing away from the “sun.”
- View Southern Lights! Visit the NOAA website and search for Aurora Australis. View the photo gallery of images of the southern lights.
- Draw it! Encourage students to draw a picture of the northern lights next time they observe them.

# Uyumiņa nunam

## Atmosphere

photo © Sacha Layos



### What is the atmosphere?

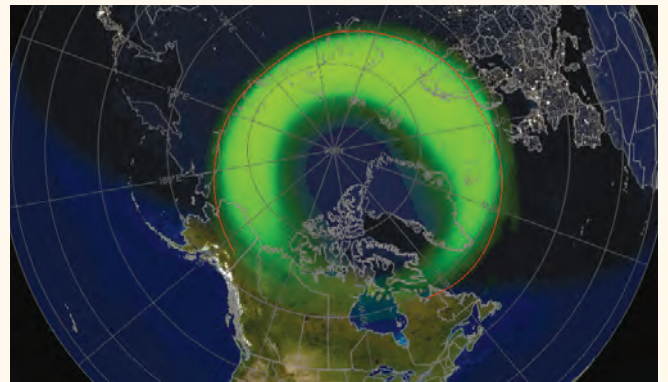
Earth's atmosphere is a thick blanket of gases that surrounds **Nunaqqak**. The Iñupiaq word for atmosphere is **uyumiņa nunam**. The **uyumiņa nunam** is made mostly of nitrogen and oxygen. When charged particles carried by the solar wind collide with gas particles in the **uyumiņa nunam**, some of the energy from the solar particles is transferred to the gas particles. This excites the gas, causing it to glow with a light that we know as the northern lights. Different gases produce different colors. Red and green are caused by energized oxygen at different altitudes. Pale purple, which can appear white or light blue to the human eye, is caused by energized nitrogen.

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*Iñupiaq value: Respect for Nature*

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NOAA/POES

# Sila

## Atmosphere

photo © Sacha Layos



### What is the atmosphere?

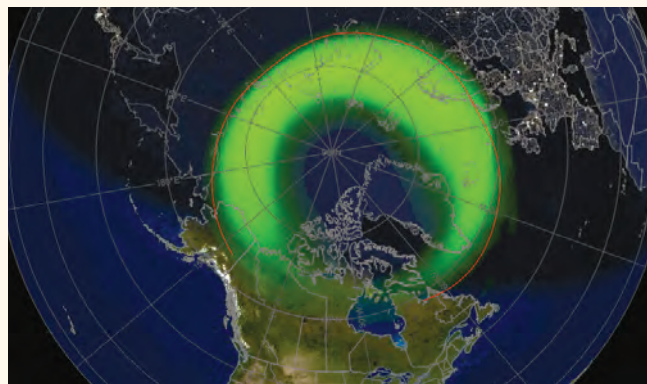
Earth's atmosphere is a thick blanket of gases that surrounds **Nunaqpak**. The Iñupiaq word for atmosphere is **sila**. The **sila** is made mostly of nitrogen and oxygen. When charged particles carried by the solar wind collide with gas particles in the **sila**, some of the energy from the solar particles is transferred to the gas particles. This excites the gas, causing it to glow with a light that we know as the northern lights. Different gases produce different colors. Red and green are caused by energized oxygen at different altitudes. Pale purple, which can appear white or light blue to the human eye, is caused by energized nitrogen.

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## Aurora Ovals

Name: \_\_\_\_\_

Visit [culturalconnections.gi.alaska.edu](http://culturalconnections.gi.alaska.edu) to learn about why the aurora forms an oval over Earth's geomagnetic north pole. Use what you learn to answer the questions below.

1. The aurora forms an oval around Earth's \_\_\_\_\_ magnetic field lines.
2. Draw and label the open magnetic field lines, the closed magnetic field lines and aurora ovals in their correct locations on the Earth image below:



3. Where does the energy that produces the aurora come from?
  - a. The sun
  - b. Earth
  - c. A power plant
4. What is an Iñupiaq word for Earth? \_\_\_\_\_
5. Why do people living near Earth's north and south poles have more opportunity to see the aurora than people living near Earth's equator?

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