

All About Earth

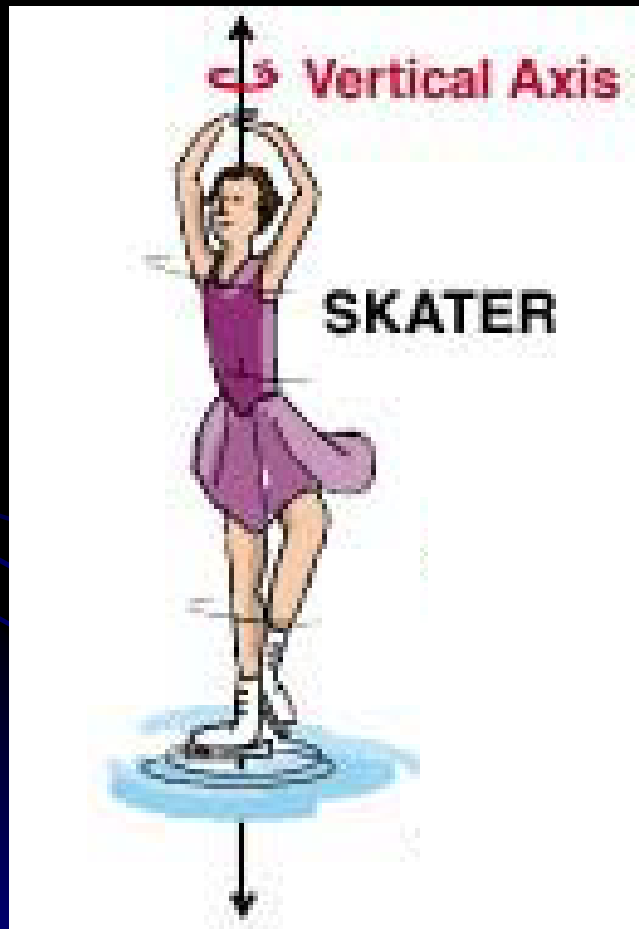
The only known planet with an environment to support life.

A decorative graphic in the bottom-left corner of the slide. It consists of three curved, parallel lines in a gradient of blue, starting from the left edge and curving downwards and to the right. Three small, solid blue circles are placed at the end of each of these lines.

What is an Axis?

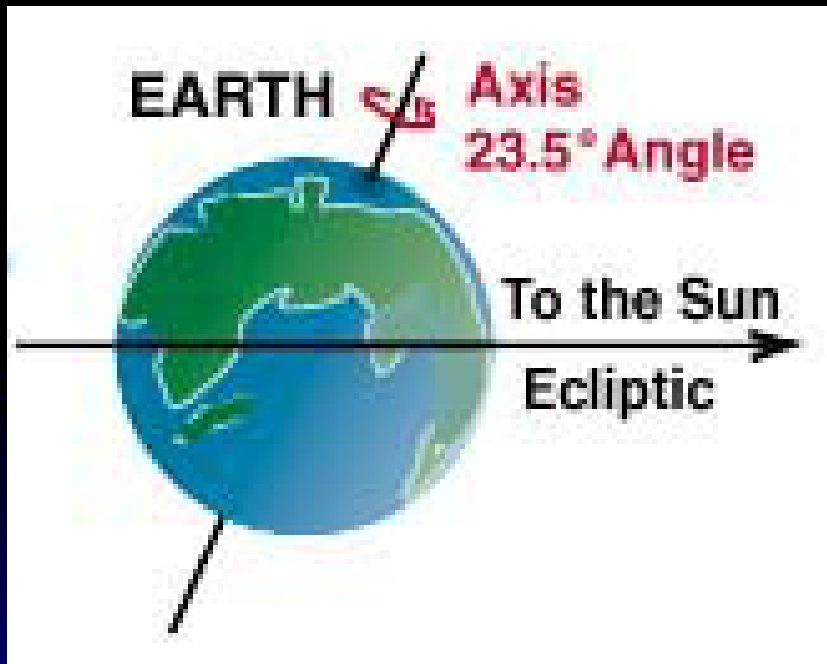
- An axis is an imaginary straight line that divides an object evenly.
- For a sphere (like a ball or a globe) the axis goes straight through the center from top to bottom.
- For planets, the axis is the imaginary straight line that the planet rotates around.

Earth's Axis




- The Earth's axis is NOT aligned straight up and down.
- For example, when an ice skater is spinning she is turning around on the axis that is straight up and down.

Earth's Axis



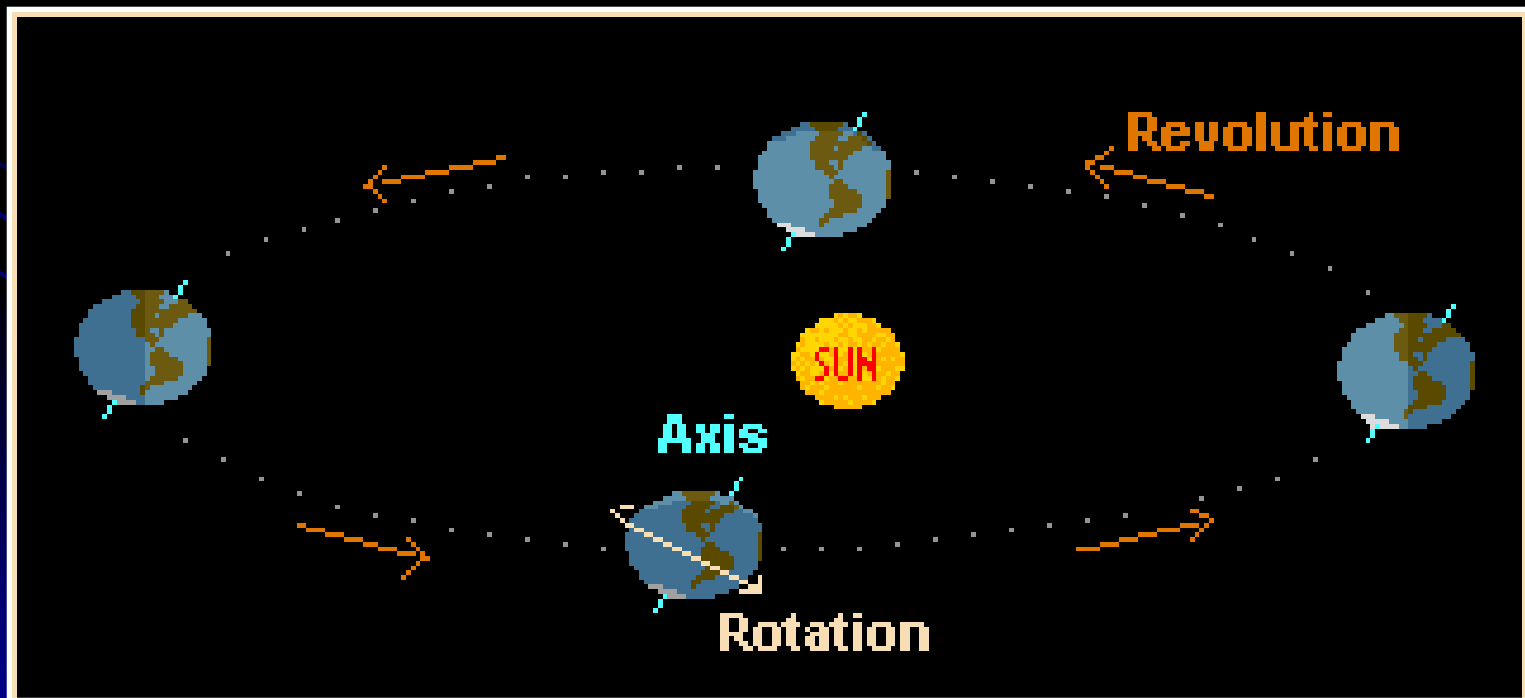
- The axis of the Earth is **TILTED** at an angle of 23.5 degrees and rotates at this angle.
- When you are roasting a marshmallow over a fire, the marshmallow is rotating around the axis of the angle of the stick.

Why do we have seasons?

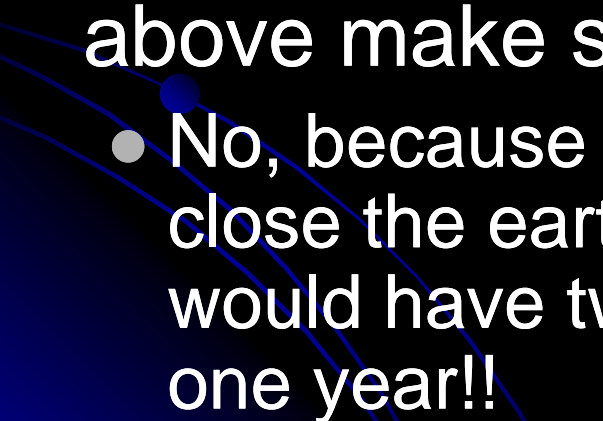
- Take a minute and think about why the Earth experiences a change in seasons.
 - Write down what you think causes the change of seasons.
 - Let's think about this together and discuss our answers as we go along.
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Why do we have seasons?

- Here is a picture showing Earth's orbit around the sun from the side view of the elliptic path. Looking at this diagram, why do we have seasons?

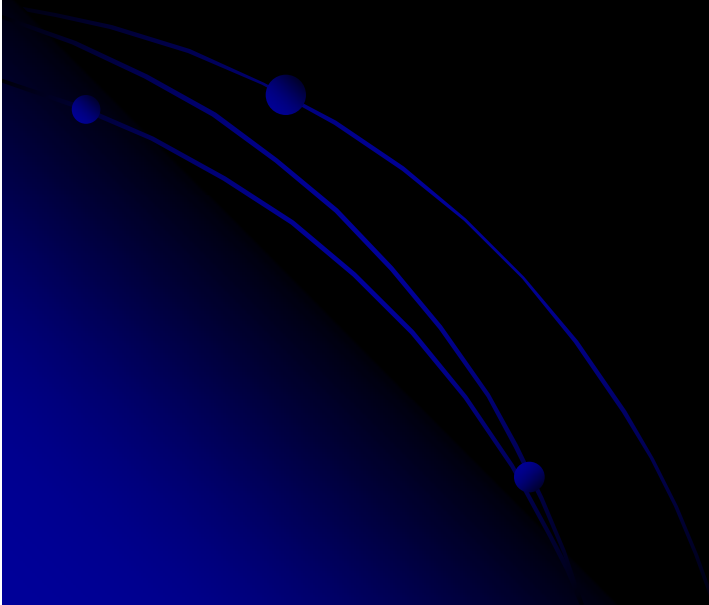
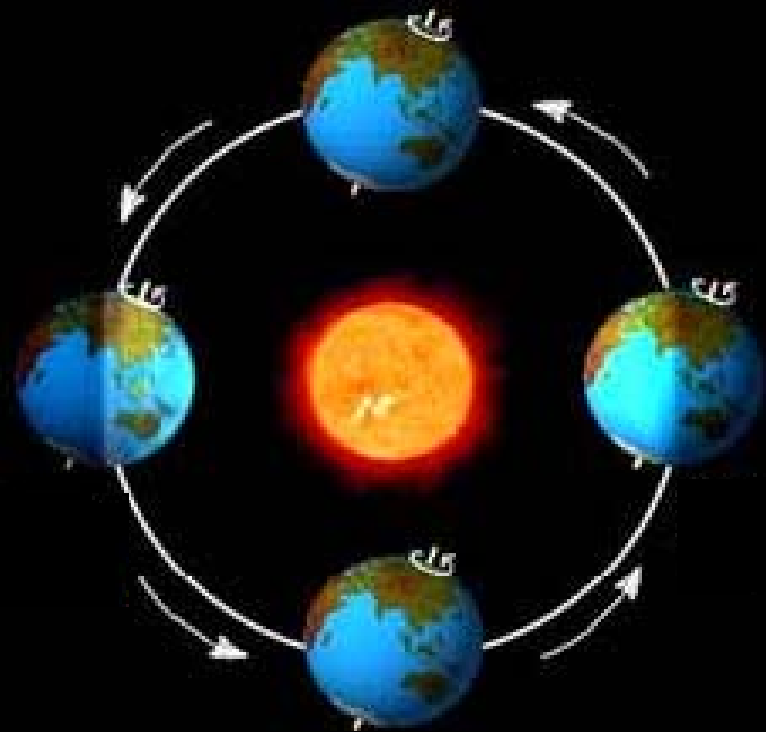


Why do we have seasons?

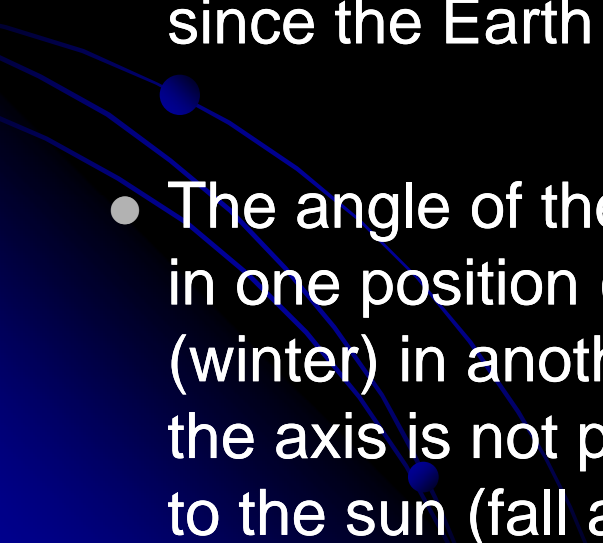
- After seeing that diagram, many people may guess that the seasons are caused by how close the Earth orbits the sun.
 - Thinking about how many seasons we experience in one year, does the reason above make sense?
 - No, because if seasons were caused by how close the earth passes by the sun, then we would have two summers and two winters in one year!!
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Why do we have seasons?


- What if we changed to a more accurate perspective viewing the elliptic path from above? Now what do think causes the change of the seasons?



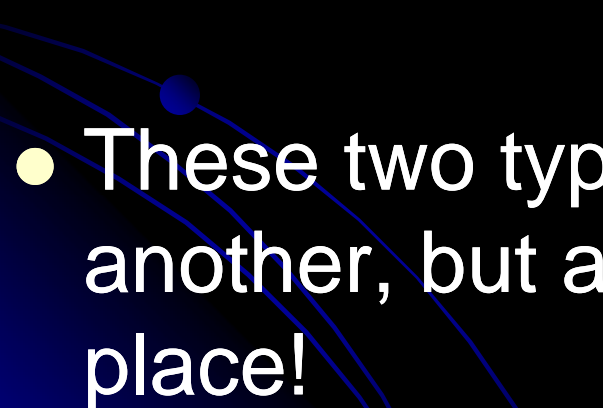
Why do we have seasons?

- Now some people may guess that the seasons are caused by the Earth's tilted axis.
 - Thinking about the second diagram of the Earth's orbit, does this make sense?
 - Yes, because the amount of light we get changes since the Earth is rotating at an angle.
 - The angle of the Earth's axis is facing toward the sun in one position (summer) and away from the sun (winter) in another. There are two positions where the axis is not pointing towards or away, but is parallel to the sun (fall and spring).
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Poles and Equator

- What about the temperatures of the north and south poles and the equator?
 - The north and south poles receive less direct sunlight during the year, so they have a much colder temperature.
 - The regions around the equator receive more direct sunlight during the year, so they have a much warmer temperature.
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Types of Poles on Earth

- The Earth has two types of poles.
 - The two types of poles are geographic poles and magnetic poles.
 - These two types of poles are near one another, but are not located in the same place!
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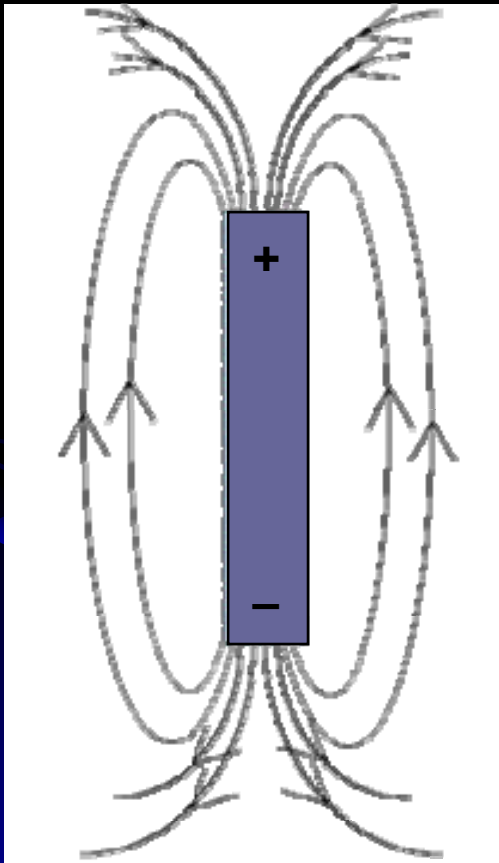
Geographic Poles

- The geographic poles of the Earth are defined as the locations where the Earth spins around its axis.
- They are located 90 degrees from the equator.
- The geographic north pole is located in the Arctic Ocean.
- The geographic south pole is located on Antarctica.

Magnetic Poles

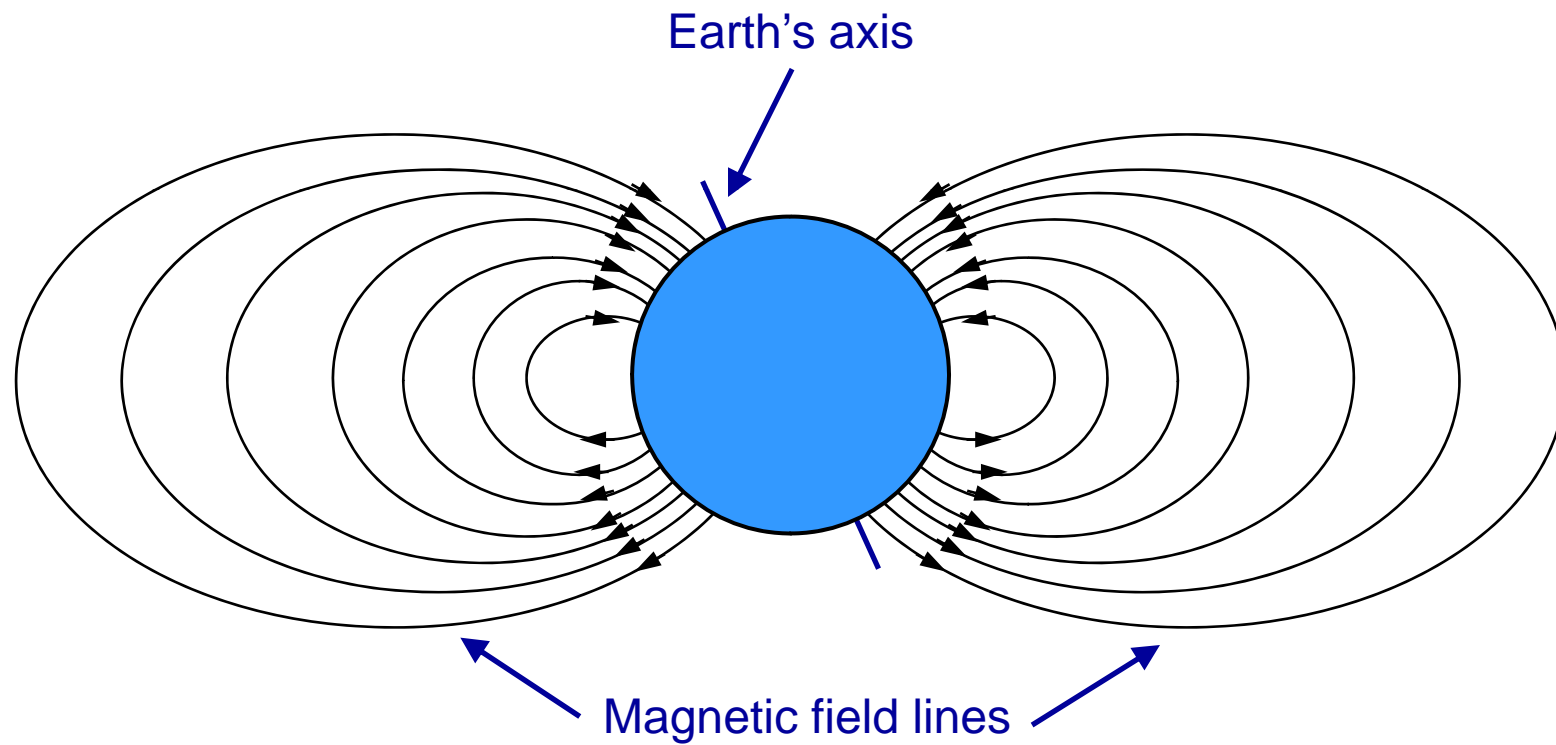
- The magnetic poles of the Earth are defined as the points where the magnetic fields are the strongest.
- They are close to the geographic poles, but are not in the exact same location.
- The magnetic pole in the north is located slightly south of the geographic north pole.
- The magnetic pole in the south is located slightly north of the geographic south pole.

Earth is a Magnet!

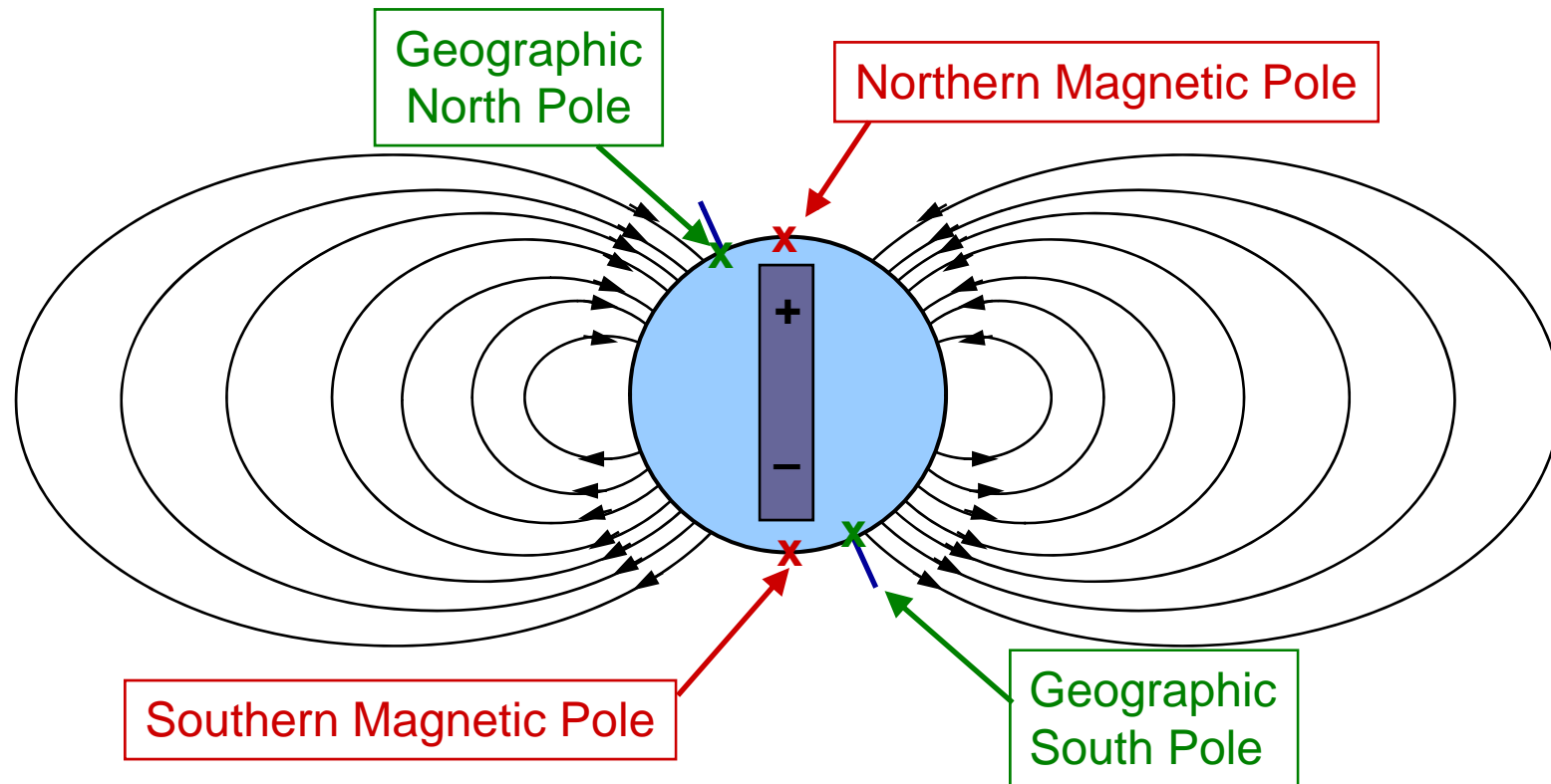


- Magnets have two poles.
- One is positive and the other is negative.
- The magnetic field lines flow from the negative to the positive pole of the magnet.
- We cannot actually see the magnetic field lines, but they can be measured.

Earth is a Magnet!



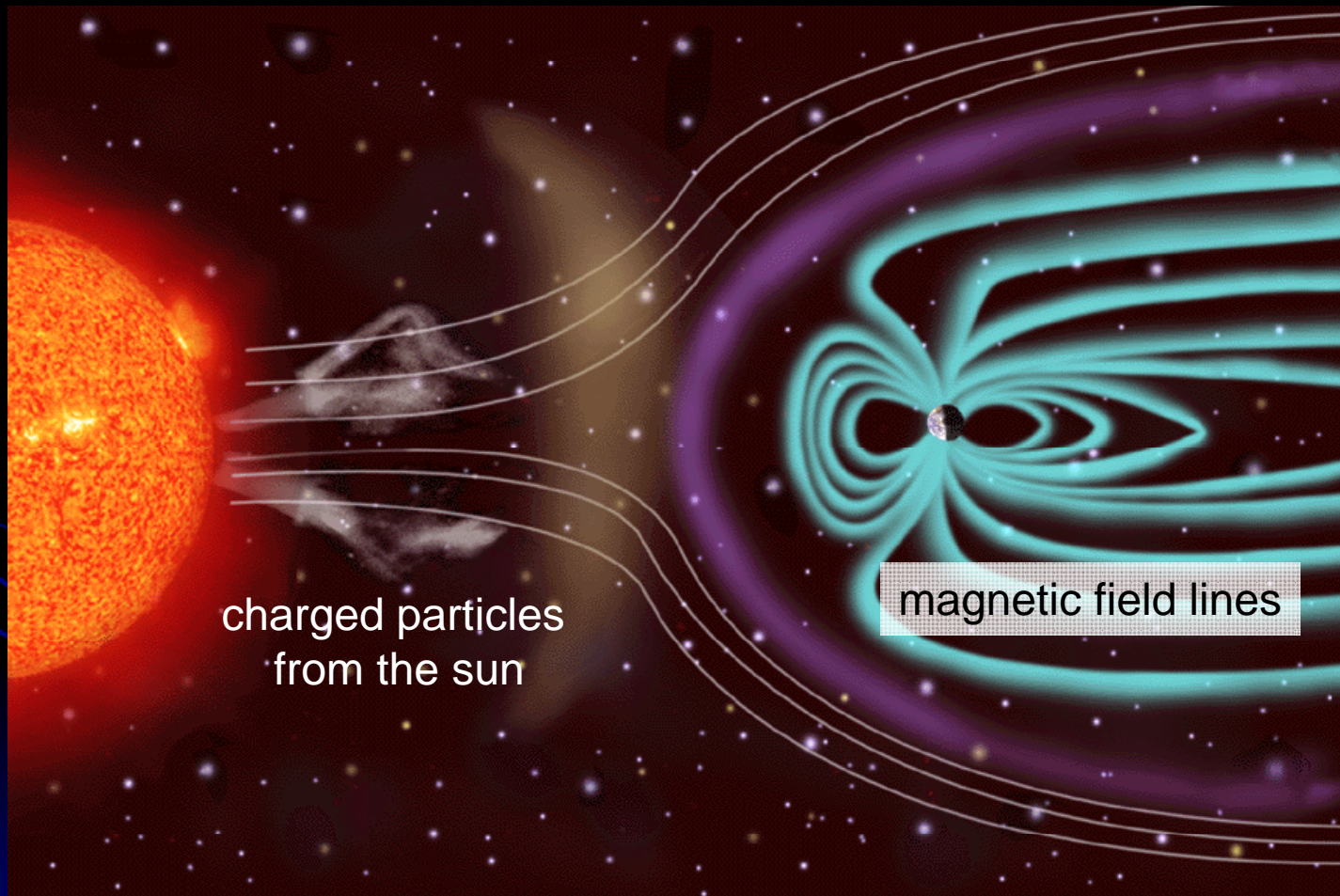
Earth is a Magnet!



Earth's Magnetic Field

- The Earth generates its own magnetic field.
- Earth's magnetic field acts as a shield.
- It protects us from solar particles that travel through space as "solar wind".
- Life on Earth is possible because the magnetic field:
 - protects us from very extreme conditions
 - allows for just the right amount of light and heat to reach the Earth.

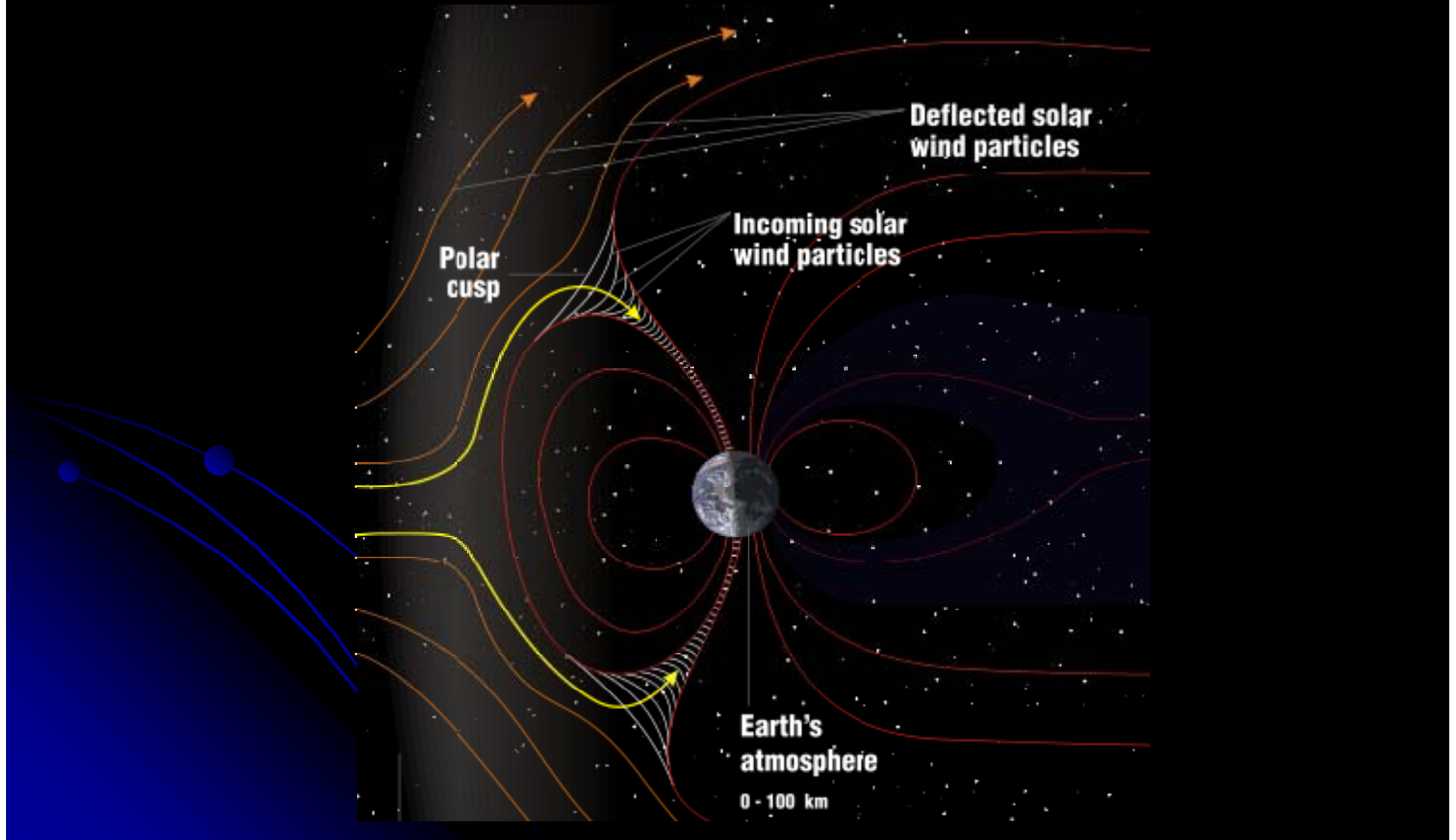
Earth's Magnetic Field



The Northern Lights

- The Northern Lights is the phenomenon when colored light is observed in the sky over the magnetic pole in the north.
- It is also called the aurora borealis, which is Latin for “northern dawn”.
- When there are storms on the surface of the sun, fast moving particles fly towards the Earth.
- These charged particles slam into atoms and molecules in the outermost part of the Earth’s atmosphere and create colored light about 100 km above the Earth’s surface.

Origin of the Northern Lights



The Northern Lights

- The light observed is constantly moving and changing.
- It usually consists of many greenish rays, forming long arcs and curtains, which stretch like ribbons across the sky.
- Most of the Northern Lights are green, but sometimes they have blue-green tinges or a mixture of green and yellow.
- Red Northern Lights are extremely rare. An even rarer occurrence is violet in the center.

Images of the Northern Lights



Photo taken by Bjørnar Hansen in Tromsø, Canada.

Images of the Northern Lights



Photo taken by Philippe Moussette on 2004 July 30 in Quebec, Canada.

Images of the Northern Lights



Photo taken by Philippe Moussette 2005 September 11 in Quebec, Canada.

Images of the Northern Lights

- Satellite view of the Northern Lights looking down on top of the Earth's northern magnetic pole.

