Auroras occur in ring-shaped regions around Earth’s magnetic poles in both the northern and southern hemispheres. The northern auroras trace a path across central Alaska, Canada, Greenland, northern Scandinavia, and Russia. The southern auroras appear mostly over the oceanic circumpolar Antarctic, but can occasionally reach the far edges of New Zealand, Chile, and Australia. It wasn’t until the Space Age, when satellites could gather images of the entire Earth, that scientists were able to see large-scale auroras around both poles at the same time. A common misconception is that auroras are exclusively seen in cold areas. The truth is that aurora can only be seen by the naked eye where there is little light – and the poles have the longest periods of darkness. Depending on the space weather that occurs during the solar cycle, the visible auroras may not be seen for days or weeks at a time, but during extreme space weather they can be seen in lower, warmer latitudes.

How Do Scientists Study Auroras?

Scientists study aurora from a variety of vantage points: below, above, and within. From below, ground based telescopes and radar look upward to track what’s happening in the sky. From above, NASA’s missions investigate what causes auroras to dramatically shift from slowly shimmering waves of light to wildly shifting streams of color. To gather observations from within an aurora, NASA uses sounding rockets—that take a quick trip through space for 5-20 minutes at a time — to fly right up into aurora as they happen in real time.

Observing aurora — and discovering what causes them to change over time — gives scientists insight on how our planet’s magnetosphere reacts to the space weather near Earth.

What Are the Different Types of Auroras?

**DISCRETE AURORAS**

Discrete auroras are bright thin bands — most common pictures are of this type. Discrete auroras occur closer to the magnetic poles.

**DIFFUSE AURORAS**

Diffuse auroras are much more spread out and thin, like a fog. They happen far off in the space weather near Earth, but don’t know that the shape of the aurora depends on the source of the electrons in the magnetosphere and how the electrons enter the atmosphere.

**DIFFERENT SHAPES**

Auroras come in many different shapes. In fact, dramatically different shapes can be seen over the course of a single night. Scientists use imaging to find out why this happens, but they do know that the shape of the aurora depends on the source of the electrons in the magnetosphere and how the electrons enter the atmosphere.

**DIFFERENT COLORS**

The color of an aurora depends on which gas is excited by the incoming particles and where that gas is located in the atmosphere. When a particle interacts with either oxygen or nitrogen, the escape energy from the interaction results in a burst of light. Oxygen and nitrogen can emit green, red, or blue lights. The combination of the different amounts of gases can produce purple, pink, and white lights. All together, the cascade of energy, location, and interactions produce the wonderful colors of the aurora.

<table>
<thead>
<tr>
<th>PRIMARY COLOR</th>
<th>ALTITUDE</th>
<th>COMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>Above 120 Miles</td>
<td>Oxygen</td>
</tr>
<tr>
<td>GREEN</td>
<td>75 - 110 Miles</td>
<td>Oxygen</td>
</tr>
<tr>
<td>BLUE</td>
<td>75 - 110 Miles</td>
<td>Nitrogen</td>
</tr>
<tr>
<td>PINK</td>
<td>Below 60 Miles</td>
<td>Nitrogen</td>
</tr>
</tbody>
</table>

**Do Other Planets Have Auroras?**

Any planet with a magnetic field and an atmosphere would likely have aurorae, and aurora have been observed on planets like Uranus and Saturn.

![Image of the Earth with auroras](image-url)

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