



NORTHERN LIGHTS - GEOGRAPHY

NEWS: Recently, Auroras, which are typically visible in high-latitude regions such as the North and South Poles, have been observed worldwide, including in areas where they are uncommon. In India, they were observed through all-sky cameras positioned around the Indian Astronomical Observatory (IAO) in Hanle, Ladakh.

WHAT'S IN THE NEWS?

What is the Aurora Phenomenon?

Auroras are bright and colourful lights formed due to an active interaction in Space between charged solar winds and the Earth's magnetosphere. They occur when violent solar events eject charged particles into space, which become trapped in Earth's magnetic field and interact with atmospheric atoms, ultimately resulting in geomagnetic storms and the creation of aurora.

The constantly changing inputs from the sun, the varying responses from the Earth's upper atmosphere, and the motion of the planet and particles in near-Earth space all work together to create different auroral motions and shapes. The phenomenon in the Northern Hemisphere is called the Northern Lights (aurora borealis); in the Southern Hemisphere, it's called the Southern Lights (aurora australis).

Mechanism of Aurora Borealis:

- 1. Electrical Connection:** Auroras result from the Earth's electrical connection to the Sun, showcasing how solar energy affects our planet.
- 2. Charged Particles:** They are triggered by electrically charged particles (primarily electrons) from the Sun, which are trapped in Earth's magnetic field.
- 3. Collisions:** The typical aurora results from collisions between these fast-moving electrons and gases (oxygen and nitrogen) in the upper atmosphere.
- 4. Energy Transfer:** Electrons from the magnetosphere transfer energy to atmospheric gases, exciting them.
- 5. Photon Emission:** As the gases return to their normal state, they emit photons (light bursts), creating the visible auroral display.
- 6. Intensity:** A significant electron influx can make bright auroras visible to the naked eye.
- 7. Origin of Auroras:**

Originate at altitudes of 100 km to over 400 km.

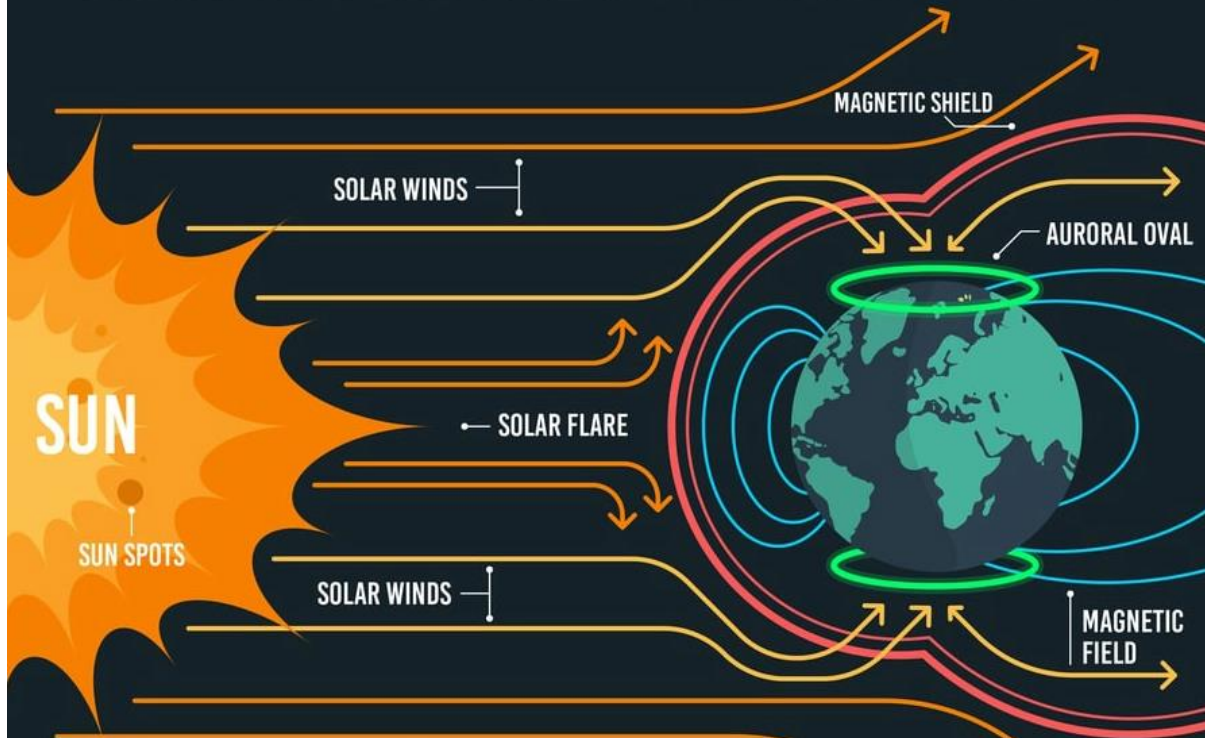
Colours and Shapes of Auroras

Colour depends on the gas (oxygen or nitrogen) being excited.

Energy levels of electrons affect emitted colours.



WHAT CAUSES THE NORTHERN LIGHTS?



8. Common Colors:

Green: High-energy electrons exciting oxygen.

Red: Low-energy collisions with oxygen.

Blue: Emitted by nitrogen.

A blending of emissions can create purples, pinks, and whites.

Ultraviolet light emissions are detectable by satellites.

Aurora Borealis in India:

1. Leh-Ladakh: This high-altitude desert region offers some of the clearest skies in India, making it a fantastic spot for stargazing. While the Aurora Borealis is unlikely, the stunning night sky filled with stars can be mesmerizing.

Best Time: October to March, when the skies are clear and the nights are long.

2. Kashmir: Known for its breathtaking landscapes, areas in Kashmir, especially around Gulmarg and Pahalgam, provide opportunities for clear night skies.

Best Time: Winter months are ideal for clearer visibility.

3. Nubra Valley: Located in Ladakh, Nubra Valley offers stunning views and minimal light pollution, making it an excellent location for stargazing.

Best Time: Summer months, especially during clear nights.



4. Mount Abu: Mount Abu has relatively clear skies as the only hill station in Rajasthan. While Auroras are not visible, the stargazing experience can still be rewarding.

Best Time: October to March.

5. Rann of Kutch: The white salt desert of Kutch in Gujarat offers unique night skies, especially during the Rann Utsav festival, which attracts many tourists for its cultural performances and clear skies.

Best Time: November to February.



Significance of Aurora Borealis:

1. Solar-Earth Connection: Provides insights into the interaction between solar winds and Earth's magnetic field.

2. Atmospheric Studies: Helps researchers understand atmospheric composition and dynamics at high altitudes.

3. Space Weather Monitoring: Acts as a natural indicator of space weather events, aiding in forecasting potential impacts on satellite and communication systems.

4. Indigenous Lore: Holds cultural importance in many indigenous Arctic communities, often featured in folklore and mythology.

5. Inspiration: Inspires art, literature, and scientific exploration, reflecting humanity's fascination with nature.

Ecosystem Impact: Affects local ecosystems by influencing weather patterns and animal behaviours in polar regions.

6. Climate Change Indicators: Changes in auroral activity may signal climate and atmospheric conditions shifts.

7. Tourism Attraction: Drives eco-tourism in regions like Norway, Iceland, and Canada, boosting local economies.

8. Educational Opportunities: Provides unique learning experiences for tourists and researchers,



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promoting awareness of atmospheric science.

9. Emotional Impact: Witnessing the aurora can evoke feelings of awe and wonder, contributing to mental well-being and a deeper appreciation for nature.

Effects:

1. Auroras affect communication lines, radio lines and power lines.
2. It should also be noted here that the Sun's energy, in the form of solar wind, is behind the whole process.

Conclusion:

Chasing the Northern Lights is not merely about witnessing a natural phenomenon; it's a journey into the heart of our planet's beauty and complexity. The science behind the Aurora Borealis and its cultural significance and environmental considerations create a rich tapestry of experiences for those fortunate enough to embark on this adventure. Whether standing under the vivid lights in a remote Arctic landscape or learning about its wonders from a knowledgeable guide, the Aurora Borealis offers a profound reminder of the mysteries of our universe and the beauty of the natural world.

