Aurora Borealis in India

Why in News?

Recently, **Auroras** which are typically visible in **high-latitude regions** such as the **North and South Poles,** were 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 is the Aurora Phenomenon?

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- **About:**
  - **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.**
    - In the Northern Hemisphere, the phenomenon is called the northern lights ***(aurora borealis),*** while in the Southern Hemisphere, it's called the southern lights ***(aurora australis).***
- **Composition and Colors:**
    - Auroras **consist of gases and particles,** including oxygen and nitrogen.
    - The collisions of these particles with the atmosphere release energy in the form of light.
    - The colors observed in auroras depend on the **type of gas and altitude** of the collisions.
- **Impact:**
    - They can trigger **blackouts on the Earth**, knock out **satellites in space**, endanger the lives of astronauts, and affect **space weather** throughout the Solar System.

Note: **STEVE** is an **aurora-like phenomenon** that appears as a distinct, purple-colored arc with a moving green "picket-fence" structure. It can be observed from **lower latitudes** than the typical northern and southern lights.

Geomagnetic Storm

- A geomagnetic storm is a major disturbance of Earth's magnetosphere that occurs when there is a very **efficient exchange of energy** from the solar wind into the space environment surrounding Earth.
- **Violent geomagnetic storms are rare,** occurring around once every few decades.
    - The last time charged particles from the Sun blew into the Earth with similar energy and intensity was in 2003.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. **Consider the following statements: (2018)**

1. The Earth’s magnetic field has reversed every few hundred thousand years.

2. When the Earth was created more than 4000 million years ago, there was 54% oxygen and no carbon dioxide.

3. When living organisms originated, they modified the early atmosphere of the Earth.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: (c)

Q. **Electrically charged particles from space travelling at speeds of several hundred km/sec can severely harm living beings if they reach the surface of the Earth. What prevents them from reaching the surface of the Earth? (2012)**

(a) The Earth's magnetic field diverts them towards its poles

(b) Ozone layer around the Earth reflects them back to outer space.

(c) Moisture in the upper layers of atmosphere prevents them from reaching the surface of the Earth

(d) None of the statements (a), (b) and (c) given above is correct

Ans: (a)