Coronal Mass Ejections

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Why is in news? Astronomers spot a surprising solar eruption that maintains constant temperature

- Scientists tracking the continuous evolution of the energy state of the core of a solar eruption that occurred on July 20, 2017, have found it strangely maintained a constant temperature as it **erupted energetic and highly magnetised plasma from the solar corona into space**.
- The finding can improve our understanding of how such eruptions can impact communication systems on Earth.
- Coronal Mass Ejections (CMEs) are **large-scale eruptions of charged particles (plasma) and magnetic fields** from the solar atmosphere into space.
- The Sun is an **extremely active object**, **spewing out vast quantities of gas and plasma** in many violent events. A class of such eruptions are Coronal Mass Ejections (CMEs).
- CMEs are the most powerful explosions happening in the solar system.
- They can **disrupt a range of ground- and space-based technologies and satellites** on Earth. Thus, it is crucial to understand their evolution and propagation through interplanetary space.
- There is a wide range of plasma temperatures within CMEs, from **cold chromospheric material** (around 104 K) to **hot plasma** (around 107 K).
- When CMEs propagate, several processes can exchange energy (electrical, kinetic, potential, thermal, and so on.), thereby heating or cooling the plasma.
- The underlying **cause of CMEs is not well understood**. Astronomers agree, **however, that the sun's magnetic field plays a major role**.
- Though CMEs can occur anywhere on the Sun, it is primarily those which **originate from regions near the centre** of the **visible solar surface** (called the photosphere) that are important for study, since they may propagate directly towards the Earth.
- This field of research **helps to understand Space Weather**.
- When the plasma cloud hits our planet, a **geomagnetic storm** follows.
- A geomagnetic storm is a **major disturbance of Earth's magnetosphere** (space controlled by earth's magnetic field) that occurs when there is a **very efficient exchange of energy from the solar wind into the space environment** surrounding Earth.
- They can **trigger intense light in the sky** on Earth, called **auroras**.
- Some of the energy and small particles **travel down the magnetic field lines at the north and south poles** into Earth's atmosphere.
- There, the particles interact with gases in the atmosphere **resulting in beautiful displays of light** in the sky.
- The aurora in Earth's **northern atmosphere** is called an **aurora borealis or northern lights**. It's **southern counterpart** is called an **aurora australis or the southern lights**.