

# UAE's Hope orbiter and discrete auroras on Mars

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## In news

UAE's Hope Mars orbiter spotted an elusive aurora on the Red Planet recently.

## Key updates

- Hope spacecraft has **captured images of glowing atmospheric lights in the Red Planet's night sky, known as discrete auroras.**
- The data gathered by the orbiter include far and **extreme ultraviolet auroral emissions** which have never been imaged before at Mars.
- The beacons of light that stand out against the dark nightside disk are highly structured discrete auroras.
- It traces out where energetic particles excite the atmosphere after being funneled down by a patchy network of crustal magnetic fields that originate from minerals on the surface of Mars.
- Unlike auroras on Earth, which are seen only near the north and south poles, discrete auroras on Mars are seen all around the planet at night time.
- Scientists have observed three types of auroras on Mars, One type of Martian aurora occurs exclusively on the daylit side of the planet; the other two occur on the nightside.
- One of the nighttime phenomena occurs only during extremely strong solar storms and lights up the whole disk.
- But the discrete aurora, the kind that scientists observed with Hope, isn't limited to periods of heavy solar activity, instead occurring only in certain patches

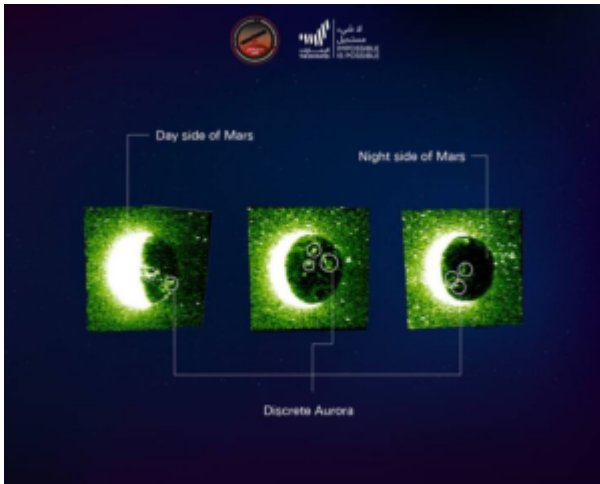
of the nightside of Mars.

### **What is an aurora and reasons for an aurora on Earth?**

- Auroras are **caused when charged particles ejected from the Sun's surface called the solar wind** enter the Earth's atmosphere.
- These particles are harmful, and our planet is protected by the geomagnetic field, which preserves life by shielding us from the solar wind.
- However, at the north and south poles, some of these solar wind particles are able to continuously stream down, and interact with different gases in the atmosphere to cause a display of light in the night sky.
- This display, known as an aurora, **is seen from the Earth's high latitude regions** (called the auroral oval), and is active all year round.
- **In the northern part of our globe**, the **polar lights are called aurora borealis** or Northern Lights, and are seen from the US (Alaska), Canada, Iceland, Greenland, Norway, Sweden and Finland.
- **In the south, they are called aurora australis or southern lights**, and are visible from high latitudes in Antarctica, Chile, Argentina, New Zealand and Australia.

### **Difference between Earth's & Martian auroras**

- Unlike Earth, which has a strong magnetic field, the **Martian magnetic field has largely died out**. This is because the molten iron at the interior of the planet which produces magnetism has cooled.
- Earth's auroras are tied to the planet's global magnetic field and are triggered by charged particles from the sun.



- The **Martian crust**, which hardened billions of years ago when the magnetic field still existed, **retains some magnetism**.
- In contrast with Earth, which acts like one single bar magnet, **magnetism on Mars is unevenly distributed**, with fields strewn across the planet and differing in direction and strength.
- These **disjointed fields channel** the solar wind to different parts of the Martian atmosphere, creating **“discrete” auroras** over the entire surface of the planet as charged particles interact with atoms and molecules in the sky as they do on Earth.

### **Significance of Martian auroras**

Its study, for scientists, can offer **clues as to why the Red Planet lost its magnetic field** and thick atmosphere— among the essential requirements for sustaining life.

### **About UAE’s Hope Mars mission**

- Also known as the Emirates Mars Mission (EMM), Hope is designed to study Mars’ atmosphere across all its layers and at a global scale throughout the course of the year.
- It is the **Arab world’s first mission to Mars**, took off from Earth in July 2020, and has been orbiting the Red Planet.
- The **objective of the mission is to study Martian weather**

### **dynamics.**

- By correlating the lower atmosphere and upper atmosphere conditions, the probe will look into how weather changes the escape of hydrogen and oxygen into space.

### **Significance of the Mission**

- By measuring how much hydrogen and oxygen is spilling into space, scientists will be able to look into why Mars lost so much of its early atmosphere and liquid water.
- It is expected to create the first complete portrait of the planet's atmosphere.
- With the information gathered during the mission, scientists will have a better understanding of the climate dynamics of different layers of Mars' atmosphere.