Ozone Found on Jupiter's Moon Callisto

Source: TH

Why in News?

Recently, a team of scientists from various countries, including **India**, has uncovered compelling evidence suggesting the existence of ozone **on Callisto, one of Jupiter's moons.**

- Previously thought of as a barren celestial body, scientists now consider that this icy moon could harbour conditions conducive to supporting life.

Note

Researchers recreated Callisto's surface conditions in the laboratory and exposed this setup to vacuum-ultraviolet photons and observed an absorption spectrum showing **ozone formation**, similar to what **Hubble** observed on Callisto in 1997.

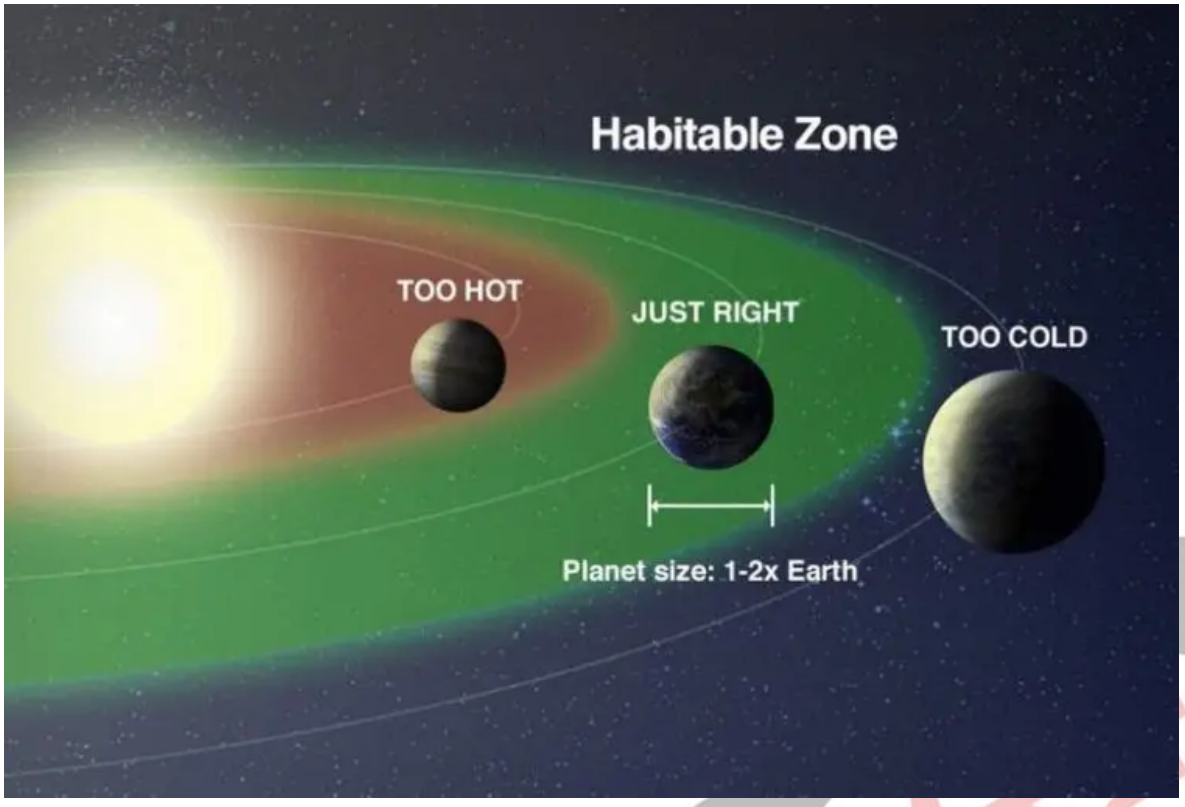
- **Ozone presence suggests the presence of oxygen, essential for life.**

What are the Key Features of Callisto?

- **About:** Callisto ranks as one of Jupiter's largest moons and is the **third-largest moon in the Solar System, following Ganymede (Jupiter) and Titan (Saturn).**
  - It was discovered in 1610, by Italian scientist **Galileo Galilei** along with **Jupiter's three other largest moons: Ganymede, Europa and Io.**
  - As per **NASA**, after **Saturn** (146), Jupiter (95) boasts the highest number of moons in the Solar System.
- **Features:** It is primarily composed of **water ice, rocky materials, sulfur dioxide, and organic compounds.**
  - Its surface is heavily **cratered**, indicating a long history of being struck by asteroids and comets.
  - It also lacks the **extensive seismic activity** seen on some of Jupiter's other moons, such as **Io and** Europa**.**

What are Some Other Potentially Habitable Celestial Bodies?

- **Habitable Zone:** Habitable zone is the distance from a star **at which liquid water could exist on orbiting planets' surfaces.**
  - Habitable zones are also known as **Goldilocks' zones**, where conditions might be just right (neither too hot nor too cold) for life.



- **Potential Habitable Celestial Bodies**
  - **Kepler 22b**: It is the first planet confirmed by NASA's Kepler mission to orbit within the habitable zone of a sun-like star.
    - The planet, 2.4 times the size of Earth, resides in a region where liquid water could potentially exist, **vital for sustaining life.**
  - **Proxima Centauri b:** Proxima Centauri b is an exoplanet, which is a planet that orbits a star other than our sun.
    - It is located in the **habitable zone of its star,** which means that it is the right distance from the star to potentially have liquid water on its surface.
    - Proxima Centauri b is also very close to Earth, at only 4.2 light-years away.
  - **TRAPPIST-1 System (Star System): The TRAPPIST-1 system** is a group of seven Earth-sized planets orbiting an ultra-cool dwarf star about 39 light-years away.
    - Several of the planets within the TRAPPIST-1 system are located within the habitable zone, and some may have liquid water on their surfaces.

Significance of Ozone

- Ozone, composed of **three oxygen atoms (O_3)** bonded together, plays a vital role in shielding planets from harmful ultraviolet radiation.
  - The ozone layer is found in the lower part of the **earth's stratosphere,** around **15-35 km above ground.**
- It acts as a protective layer in Earth's atmosphere, absorbing most of the sun's harmful **ultraviolet (UV) radiation** and preventing it from reaching the surface.
  - Ultraviolet radiation in particular is harmful to many species (but also useful to some others).
  - Two of its components, called **ultraviolet-B and ultraviolet-C** can damage DNA, trigger mutations, and increase the risk of **skin cancer** and cataracts in humans.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q1. Which one of the following is associated with the issue of control and phasing out of the use of ozone-depleting substances? (2015)

(a) Bretton Woods Conference
(b) Montreal Protocol
(c) Kyoto Protocol
(d) Nagoya Protocol

Ans: (b)

Q.2 Which one of the following planets has largest number of natural satellites or moons? (2009)

(a) Jupiter
(b) Mars
(c) Saturn
(d) Venus

Ans: (a)