



## Methane in the Moons of Saturn

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### Why in News

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**NASA's (National Aeronautics and Space Administration) Cassini spacecraft** had detected an unusually high **concentration of methane, along with carbon dioxide and dihydrogen, in the moons (Titan and Enceladus) of Saturn** by flying through their plumes (in 2017).

- It found that **Titan** has methane in its atmosphere and **Enceladus** has a liquid ocean with erupting plumes of gas and water.
- An international research team has used new statistical methods to understand if methanogenesis or methane production by microbes could explain the molecular hydrogen and methane.

### Key Points

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- **Findings:**
  - Cassini found **ice particles, salts, hydrogen and organic molecules** in the plumes, tentative **hints of an ocean that is similar to Earth's oceans** in composition.
  - There is also evidence for **alkaline hydrothermal vents on Enceladus' seafloor**, similar to those **that support methanogens in Earth's oceans**.
- **About Methanogens:**
  - Most of the methane on Earth has a biological origin. **Microorganisms called methanogens are capable of generating methane** as a metabolic byproduct.
  - They **do not require oxygen to live** and are widely distributed in nature.
  - They are **found in swamps, dead organic matter, and even in the human gut**.
  - They are **known to survive in high temperatures** and simulation studies have shown that they **can live in Martian conditions**.
  - Methanogens have been widely studied to understand **if they can be a contributor to global warming**.

- **Possibility of Methanogens on Enceladus:**
  - Methane **could be formed by the chemical breakdown of organic matter** present in Enceladus' core.
  - **Hydrothermal processes** could help the formation of carbon dioxide and methane.
  - Enceladus' hydrothermal vents **could be habitable to Earth-like microorganisms (Methanogens).**

## Saturn

- Saturn is the **sixth planet from the Sun and the second largest planet** in our solar system.
- Adorned with thousands of beautiful ringlets, Saturn is unique among the planets. It is not the only planet to have rings—made of chunks of ice and rock—but none are as spectacular or as complicated as Saturn's.
- Like fellow gas giant Jupiter, Saturn is a massive ball made mostly of hydrogen and helium.
- **Few missions** have visited Saturn: Pioneer 11 and Voyagers 1 and 2 flew by; But Cassini orbited Saturn 294 times from 2004 to 2017.

## Titan

- Titan is the **largest moon of Saturn** and the second largest moon in our solar system. **Jupiter's moon Ganymede** is just a little bit larger.
- It has **liquid rivers, lakes, and seas on its surface** (though these contain hydrocarbons like methane and ethane, not water).
- Titan's atmosphere is **made mostly of nitrogen**, like Earth's, **but is four times denser.**
- Unlike Earth, it has **clouds and methane rain.**
- Because it is so far from the **Sun it's surface temperature is (-179 degree Celsius).**

## Enceladus

- Enceladus is **a small, icy moon which has an abundance of hydrogen molecules** in water plumes. 98% of the gas in the plumes was found to be water and **1% is hydrogen** and the remaining is a mixture of molecules of carbon dioxide, methane, and ammonia.
- Underwater **vents present on Enceladus resemble the vents present on Earth's ocean floors**, where microbes and other sea life congregate.

**Source: IE**