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Search for life signal on Titan

Scientists will comb data sent back from Titan by the Huygens probe for the chemical signature of life in a bid to identify the moon's source of methane.

Methane is constantly destroyed by UV light so there must be a source within Titan to replenish the atmosphere.

Life is a possible - though some think unlikely - source of this hydrocarbon along with geological processes.

The surface is too cold for biology, but microbes could survive in an ocean within Titan, a senior scientist says.

Titan: An atmosphere not unlike Earth's billions of years ago

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Methane can also be released from a trapped form called clathrate and produced by a geological process called "serpentinisation". Neither of these involve biology.

Dominated by nitrogen, methane and other organic (carbon-based) molecules, Titan is thought to resemble a deep-frozen version of Earth 4.6 billion years ago.

Liquid methane rains down on Titan into river channels carved between hills of water ice. Reservoirs of this hydrocarbon probably lie on or just below the surface.

But UV light would destroy all the methane on Titan within 10 million years if it were not being constantly renewed.

"We cannot say there is absolutely no chance for life," Dr Francois Raulin, one of three interdisciplinary scientists on the Huygens mission, told the BBC News website.

> **"We have liquid water, organics not so far away; we have everything on Titan to make life"**
>
> Francois Raulin, University of Paris

"There is no chance for life on the surface because it is too

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cold and there is no liquid water.

"However, models of Titan's interior show there should be an ocean about 100km deep at around 300km below the surface."

If the models are correct, this ocean would be composed mostly of liquid water with about 15% ammonia at a temperature of about -80C, said Dr Raulin.

"We have liquid water, organics not so far away; we have everything on Titan to make life," he explained.

Work in progress

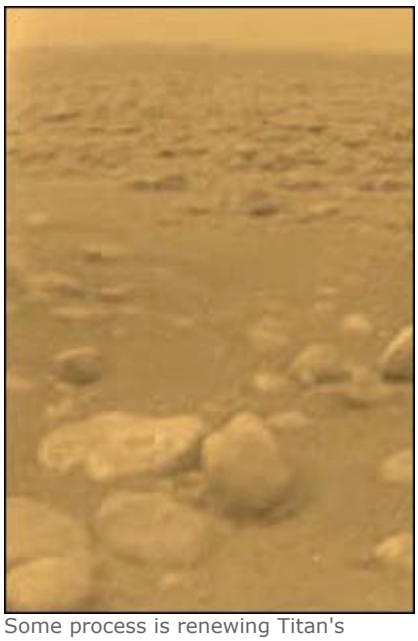
If methane-producing microbes had colonised this habitable zone, scientists might detect its chemical signature by looking at the relationship of two forms (or isotopes) of the element carbon - C12 and C13.

Living cells preferentially incorporate C12. So compounds produced by living things should be depleted of "heavier" isotopes such as C13; they are said to have a high C12/C13 ratio.

Scientists should be able to measure this ratio in data sent back by the Gas Chromatograph Mass Spectrometer (GCMS) instrument on Huygens.

"The GCMS can directly detect the C12/C13 carbon ratio. We haven't done that yet, but we're working on it," said Sushil Atreya, a professor of planetary science at the University of Michigan, US, and a GCMS team member.

"It's one factor we can take into account to figure out how methane is getting replenished."



Some process is renewing Titan's supply of methane

However, Professor Atreya favours the geological process of serpentinisation as a more likely source of the Saturnian moon's methane.

In serpentinisation, geothermal activity generates methane through the oxidation of metals such as iron, chromium and magnesium which could be contained in crustal rocks below Titan's surface.

Another possibility is that methane molecules are trapped in a water-ice matrix called clathrate (or methane hydrate).

Dr Raulin also considers these geological processes as viable sources of methane on Titan.

On 14 January, the spacecraft plunged through the moon's atmosphere, sending scientific data - including stunning images - back to ground controllers.

It landed on Titan at around 1138 GMT at a leisurely speed of around 5m/s and transmitted a signal until at least 1555 GMT.

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