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Titan is Electric

Summary (Oct 28, 2008): Scientists have determined that Saturn's moon Titan could have electrical storms occurring in its atmosphere. Such storms might provide energy for the formation of important organic and pre-biotic molecules.

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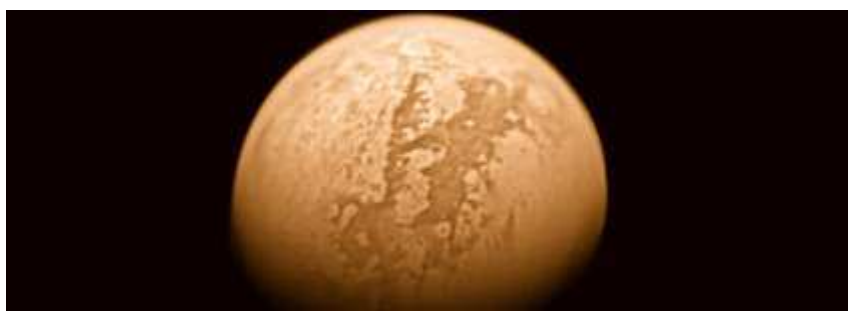

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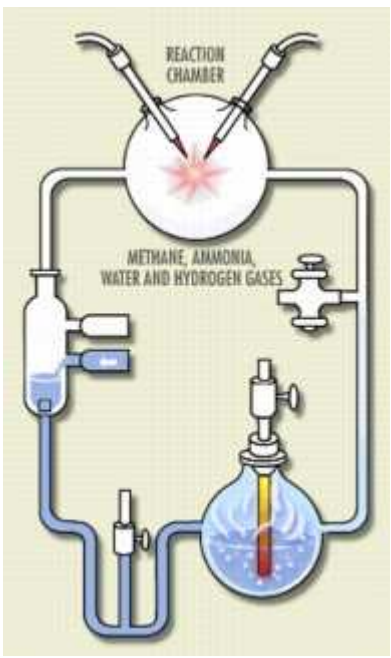
Titan is Electric

Based on a University of Granada news release

Many scientists believe that precursor molecules for life are more likely to form on planets or satellites where electrical storms occur in the atmosphere. Physicists at the University of Granada and the University of Valencia (Spain) have been analyzing data sent by the Huygens probe from Titan, the largest moon of Saturn, and have proved "in an unequivocal way" that there is natural electric activity in Titan's atmosphere. The study has been recently published in the journal Icarus.

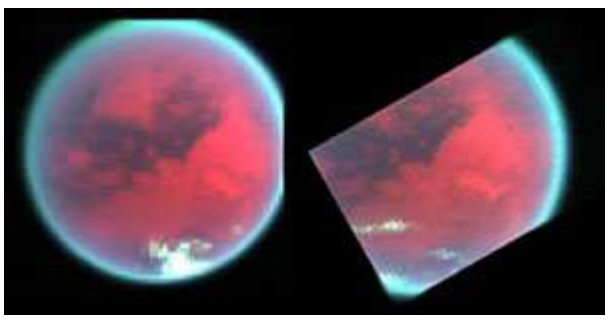
Researcher Juan Antonio Morente, from the department of Applied Physics of the University of Granada, says that Titan has been considered "a unique world in the solar system" since 1908, when Spanish astronomer Jose Comas y Sola found out that it had an atmosphere, something non-existent in other satellites.

"In this moon there are clouds with convective movements and therefore there can be static electric fields and stormy conditions", he explains. "It significantly increases the chance that organic and pre-biotic molecules get formed, according to the theory of Russian biochemist Alexander I. Oparin and Stanley L. Miller's experiment." The Urey-Miller experiment managed to synthesize organic compounds from inorganic ones by using electric shocks. "Therefore, Titan has been one of the main objectives of the Cassini-Huygens combined mission of the NASA and the European Space Agency (ESA)", said Mr. Morente.



The Miller-Urey experiment generated electric sparks - meant to model lightning - in a mixture of gases thought to resemble Earth's early atmosphere.
Credit: *AccessExcellence.org*

An enormous resonant cavity



These false color images show evidence of changing weather patterns in the skies over Titan's southern hemisphere. In the first image (left), taken Oct. 26, 2004, Titan's skies are cloud-free except for a patch of clouds over the south pole near the bottom of the image. In contrast the image at right, taken Dec. 13, 2004, shows extensive patches of clouds formed over temperate latitudes.
Credit: *University of Arizona/JPL/NASA*

More ite
says
that, in order to detect the natural electric activity of planets such as Earth or satellites such as Titan, it is necessary to measure the so-called "Schumann resonances", a set of spectrum peaks in the extremely low frequency (ELF) portion of the Earth's electromagnetic field spectrum. Such peaks occur because of the space between the surface of the Earth and the conductive ionosphere. The limited dimensions of the Earth cause this waveguide to act as a resonant cavity for electromagnetic waves, which present two basic components: a radial electric field and a tangential magnetic field, together with a weak tangential electric field un campo (one hundred times smaller than the radial component).

The electric field of Titan was measured by the sensor of mutual impedance (MIP), one of the instruments transported by the Huygens probe. The MIP consisted of four electrodes, two transmitters and two receptors, and there was a couple of transmitter-receptor in each of the pull-down arms en of the probe. The MIP sensor was preferably used to measure the atmospheric electric conductivity, but it also acted as a dipole antenna, measuring the natural electric field in the atmosphere.

"In a stable descent, without rolling, the MIP sensor would have been able to measure the peak tangential component of the electric field", says Morente, "but unfortunately a strong wind made the probe roll and the electrodes measured a superposition of such tangential and radial component."

Flat spectrum

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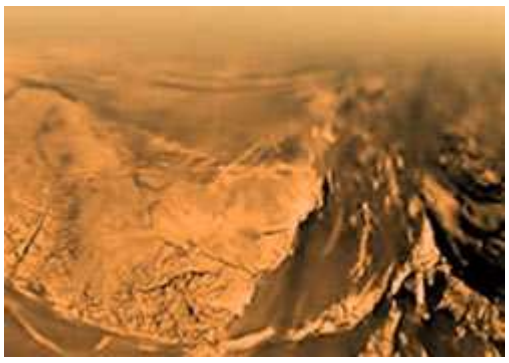
Despite the problems, the electric field spectrums directly received from Huygens turned out to be relatively flat and no Schumman resonances were observed. However, with some extra evaluation of the data, the Spanish research team managed to revealed hidden Schumman resonances. Ultimately, they believe they have found "the irrefutable proof" of natural electric activity in the atmosphere of Titan.

The work was supported by the former Ministry of Education and Science, the Andalusian Council and the European Union. also explains that the atmosphere of this moon of Saturn is an electromagnetic environment with high losses, and that its resonant cavity is less ideal than that of the Earth.



This image of Titan's unique surface was taken by the European Space Agency's Huygens probe during its descent on Jan. 14, 2005.
Credit: *ESA/NASA/JPL/University of Arizona*

With its thick, distended atmosphere, Titan's orange globe shines softly, encircled by a thin halo of purple light-scattering haze.
Credit: *NASA/JPL/Space Science Institute*

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Note: *Titan*

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Tuesday, October 28, 2008