# Spanish scientists confirm the existence of electric activity in Titan

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Physicists of the University of Granada and the University of Valencia (Spain) have developed a proceeding to analyse specific data sent by the Huygens probe from Titan, the largest moon of Saturn, proving "in an unequivocal way" that there is natural electric activity in its atmosphere. The scientific community thinks that there is a higher probability that organic molecules precursors to life could form in those planets or satellites which have an atmosphere with electric storms.

Researcher Juan Antonio Morente, from the Department of Applied Physics of the University of Granada, has informed the SINC that Titan is considered to be "a unique world in the Solar System" since 1908, when Spanish astronomer José Comas y Solá 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 prebiotic molecules get formed, according to the theory of Russian biochemist Alexander I. Oparín and Stanley L. Miller's experiment", who 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 the researcher.

## An enormous resonant cavity

Morente 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 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 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 to roll and the electrodes measured a superposition of such tangential and radial component".

## Flat spectrum

Despite this, the electric field spectrums directly received from Huygens were not due to the standards expected by scientists, as they were relatively flat and no Schumman resonances were observed. The Spanish research team, however, manage to design a proceeding to reveal Schumman hidden resonances, base don the separation of temporary

signals so-called "early" and "late-time", which allowed them to obtain "the irrefutable proof" of that there is natural electric activity in the atmosphere of Titan.

This work, which has been subsidized 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 idean than that of the Earth.

Source: Universidad de Granada

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