# Calculi carried out in the UGR will check the existence of rays in Titan's atmosphere

**06.11.2006** › nächste Meldung ›

**The mission started in 1997, when the satellite Cassini and the probe Huygens started together their trip Saturn, the second biggest planet of the solar system and famous for its rings.**

At the end of 2004 they reached their objective and set their division in motion: Cassini, constructed by the NASA, heavier (6 tons), will orbit around the planet until it stops operating in 2008; small Huygens (just 350 kilos), a product of the European space agency (ESA), started its trip to Titan last Christmas and will reach its surface the 14th of January, providing data Cassini will send to Earth.



The main aim of this project, one of the most ambitious in the last 20 years, is checking if there are favourable conditions for life in Saturn and Titan. One of the factors they intend to study is electric activity in the atmosphere of the satellite as, according to one of the main scientific theories on the origin of life on Earth, this process could burst from electric discharges which "broke" the molecules, which where simpler at the beginning, generating more complex structures lead to organic molecules.

Storm measurement

That is why checking Titan's electric activity is so important. HASI (Huygens Atmospheric Structure Instrument), is the main instrument to this end. It is situated in Huygens and it has been developed by European scientists with the collaboration of the Andalusian Institute for Astrophysics to cross the 170 kilometres of Titan's atmosphere, they will carry out measurements that could not be done otherwise. Scientists presume that there must be electric activity, because on Earth, with a less dense atmosphere, about 2,000 storms cause 50 rays per second.

But the question is how to register storms in an experimental way. Different attempts carried out by Cassini, and even by mission Voyager (1980), have been unsuccessful. "The irrefutable proof of electric activity in the atmosphere of a planet or satellite are Schumann´s frequencies", argues Juan Antonio Morente, researcher of the group 'Electrodynamics of Transitory Phenomenon' of the University of Granada (Universidad de Granada [http://www.ugr.es]), supervised by Alfonso Salinas. These frecuencias are like the fingertip of the atmospheric electric activity, as they remain stored in the large "soundbox" formed by the solid surface and the ionosphere.

Schumann predicted by mathematic calculus which would be the frequencies in which there would be electromagnetic resonances on earth's atmosphere. However, "there is a gap between predictions and measurements, as the ionosphere is a system with leakages due to its high conductivity", explains Morente. One of his research lines centres on creating numeric models simulating electromagnetic phenomenon in atmospheres of different planets or satellites. The model is based on a three-dimensional circuit called "electric analogue" which works just like the original system, in this case the electromagnetic cavity of the atmosphere.

Atmospheric models



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scientists in the UGR [http://www.ugr.es]. This way, they can predict at what frequency electromagnetic resonances will be detected. The model recreating earth's atmosphere "predicted with high accuracy the displacement of Schumann's frequencies due to the leakage related to conductivity", reminds Morente. Through these works, Konrad Schwingenschuch, of the Graz Institute for Space Research (Austria) and scientific coordinator of the instrument HASI in the mission Cassini-Huygens, got in touch with the researchers of Granada to carry out a model of Titan's atmosphere.

The scientists of the UGR carried out several models from the present data on Titan's aeronomy which incorporate different scientific hypotheses on unknown aspects of the satellite, such as the features of its surface or the atmosphere's conductivity. This work, published in the journal of the American Astronomic Society Icarus in 2002, will be useful as a reference to adjust the measuring the probe Huygens will take of Titan's activity. According to this model, what do they intend to achieve?

"There may be electric activity but it may not come out due to the density, high deepth and conductivity of the atmosphere. Or there may not be any activity, although it is a very dynamic atmosphere even with at such low temperatures (-180ºC). In any case, it is difficult to predict", comments Juan Antonio Morente. The collaboration of the research group of Granada with the Graz Institute for Space Research continues in the mission Mars-Netlander, a project of the ESA which intends to study Mars´ magnetic field. The launch is predicted in 2007.

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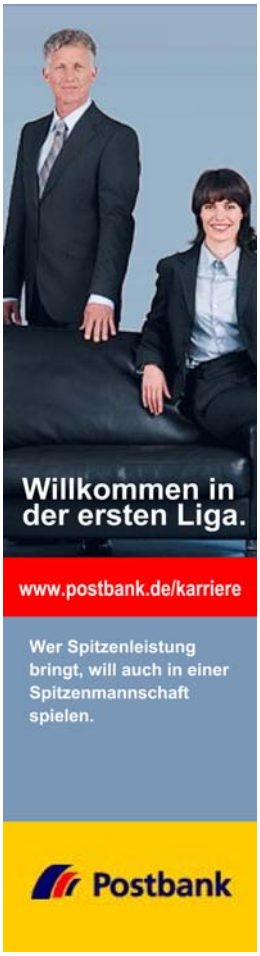


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