

MIPT-based researcher models Titan's atmosphere

July 24 2014

A researcher from Moscow Institute of Physics and Technology, Prof. Vladimir Krasnopolsky, who heads the Laboratory of High Resolution Infrared Spectroscopy of Planetary Atmospheres, has published the results of the comparison of his model of Titan's atmosphere with the latest data.

The article in the journal *Icarus* compares the chemical composition of Titan's atmosphere with parameters predicted by a [mathematical model](#). The atmosphere of Saturn's largest moon was described by a model that took into account the presence of 83 neutral molecules, 33 ions and 420 different chemical reactions between them. Despite the fact that Titan is located much further from the Sun than the Earth and that radiation flux coming from the Sun to the moon is 100 times lower, the intensity of UV rays is enough to spur photochemical reactions in the upper layers of Titan's atmosphere.

The data regarding the composition of Titan's atmosphere, which is 1.6 times denser near the surface than the Earth's air, was obtained from several sources, mainly the Cassini orbiter. It was equipped with a number of gauges, including ultraviolet and infrared spectrometers and equipment for studying the ions that were drawn into space. Within ten years in Saturn's orbit, a plasma complex and a mass spectrometer designed specifically for this research project gathered enough data to compare it with mathematical models.

In addition to Cassini, part of the data was obtained using the IRAM

ground submillimeter telescope and the Hershel infrared space observatory. Data on the distribution of aerosol particles in Titan's atmosphere was received from a unique space capsule, Huygens, which landed on Titan for the first time in the history of mankind and sent the first photos of its surface.

Comparing this data with the previously developed model, Krasnopolsky showed that the theoretical description of Titan's atmosphere matches the reality quite accurately. There are discrepancies, however, but they are caused by inevitable measurement errors – so far, the concentrations of many substances are approximate. The most important thing is not the absolute matching of specific parameters but the correctness of the general model of chemical processes.

"The coherence of the model with reality means that we can correctly tell where different substances go from Titan's ionosphere and where they come from," Krasnopolsky said.

Krasnopolsky is considered a leading global expert on the [atmosphere](#) of celestial bodies of the solar system. He has participated in the creation of spectrometers for a variety of spacecraft, including the legendary Voyagers and the first Soviet interplanetary probes.

Provided by Moscow Institute of Physics and Technology

Citation: MIPT-based researcher models Titan's atmosphere (2014, July 24) retrieved 6 May 2024 from <https://phys.org/news/2014-07-mipt-based-titan-atmosphere.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.
