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Data from Saturn moon mission intrigues U-M scientists

Titan is the only moon in our solar system with an atmosphere

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BY ANNE RUETER
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On Jan. 14, Saturn's moon Titan briefly gleamed in the imaginations of millions of people around the world, as news spread that the Cassini mission's Huygens probe had landed intact on Titan's frigid surface and was able to beam back far more data than anticipated. The glow of success - landing a small spacecraft on a moon nearly a billion miles away -

isn't over for two University of Michigan space scientists, Sushil Atreya and George Carignan.

"We'll be looking at the data for years to come," says Atreya, a member of two Huygens instrument teams. One, a gas chromatograph mass spectrometer, was partly built at U-M.

Atreya is working intensely to analyze data from the instruments that reveal in detail what chemical elements make up Titan's atmosphere. He will publish results and present findings at meetings of scientists in Europe in the next few months. He and others are particularly excited at intriguing new evidence of conditions on and above Titan:

University of Michigan space scientist Sushil Atreya, center, appeared in Darmstadt, Germany, iwth other scientists to discuss the Huygens probe 12 hours after it landed on Saturn's moon Titan. Photo courtesy S. Way, NASA.

- A thick layer of methane gas in Titan's troposphere, the lower part of the atmosphere.
- Flow marks and other signs that liquid methane may exist in significant amounts on Titan's surface.

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With the new findings, scientists suspect methane plays a role similar to water in weather on Titan, the only moon in our solar system with an atmosphere.

Years in the making

Both Carignan and Atreya can trace their involvement in the Huygens project back nearly 20 years. Carignan, now an emeritus professor in U-M engineering college, played a role in the instrument's conceptual design. Like Atreya, he gathered with other scientists involved in the European Space Agency's Huygens mission at Darmstadt, Germany Jan. 14, eager to trace the spacecraft's descent and to share the excitement of analyzing data streaming back if the mission was a success.

"As Huygens descended, we were discovering things as we were going down, every second," says Atreya. Scientists already had evidence from remote investigations that methane was present.

But "what we saw in methane in the troposphere was new," Atreya says. "What we saw on the surface was totally unexpected."

One of six instruments aboard the Huygens craft, the mass spectrometer sampled atmospheric gases on the way down and kept measuring airborne particles as the 700-pound craft sat on Titan's surface.

Methane's intriguing role

Thanks to the instrument, scientists now know the precise ratio of nitrogen to methane in Titan's atmosphere, says Carignan. Titan's atmosphere, made up mostly of these two gases, is of great interest because scientists believe it resembles the atmosphere of early Earth.

Methane, normally a gas on Earth, is a highly flammable liquid at Titan's surface temperatures of about 290 degrees below zero Fahrenheit.

At least at the location where Huygens landed, scientists saw evidence of fluvial action and a lake bed, and what appeared to be wet clay or sand - all thought to be signs of the current or recent activity of liquid methane. Methane's role on Titan, Carignan says, "is rather analogous to water on Earth." Methane apparently evaporates into the atmosphere, forms clouds, rains and forms more clouds.

Atreya and others want to learn more about how Titan's methane apparently is replenished. If it weren't, the sun's ultraviolet rays would have destroyed methane in the atmosphere after 10 million years, and Titan today would have no atmosphere, Atreya says.

NASA has asked a group of space scientists to list possible places in the outer solar system to visit or revisit with unmanned missions. Atreya expects Titan will be near the top of the list. Huygens provided data from only one spot on Titan; scientists would like to return to map the whole surface, learn more about the atmosphere's chemistry and perhaps drill into the interior, where methane may reside.

"When we look at Titan, the possibility is that we might be looking at Earth before life began," Atreya says. He and some scientists think they might find "prebiotic molecules," combinations of elements thought to have existed on Earth before life forms developed.

Titan's lessons could be instructive, he adds, when scientists begin looking in more detail at planets in other solar systems.

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