Scientists discover storms in the tropics of Titan

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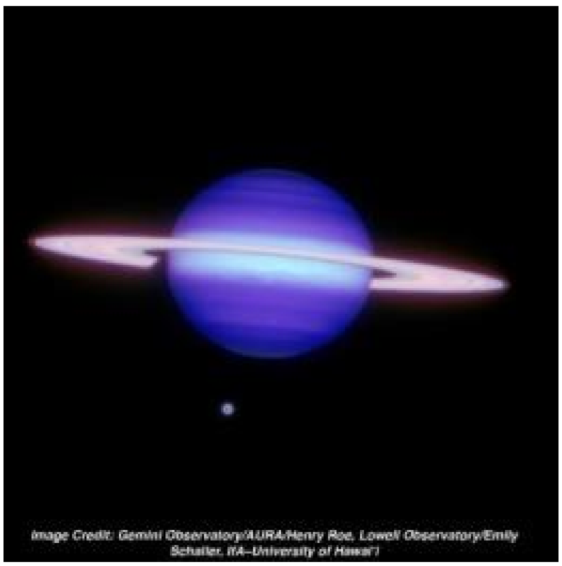


This is an adaptive optics image from Gemini Observatory of Titan passing nearly directly in front of Saturn. Titan, as usual, looks quite bland, with no hint of clouds. Credit: Gemini Observatory/AURA/Henry Roe, Lowell Observatory

For all its similarities to Earth -- clouds that pour rain (albeit liquid methane not liquid water) onto the surface producing lakes and rivers, vast dune fields in desert-like regions, plus a smoggy orange atmosphere that looks like Los Angeles's during fire season -- Saturn's largest moon, Titan, is generally "a very bland place, weatherwise," says Mike Brown of the California Institute of Technology.

"We can watch for years and see almost nothing happen. This is bad news for people trying to understand Titan's meteorological cycle, as not only do things happen infrequently, but we tend to miss them when they DO happen, because nobody wants to waste time on big telescopes—which you need to study where the clouds are and what is happening to them—looking at things that don't happen," explains Brown, the Richard and Barbara Rosenberg Professor of Planetary Astronomy.

However, just because weather occurs "infrequently" doesn't mean it never occurs, nor does it mean that astronomers, in the right place at the right time, can't catch it in the act.

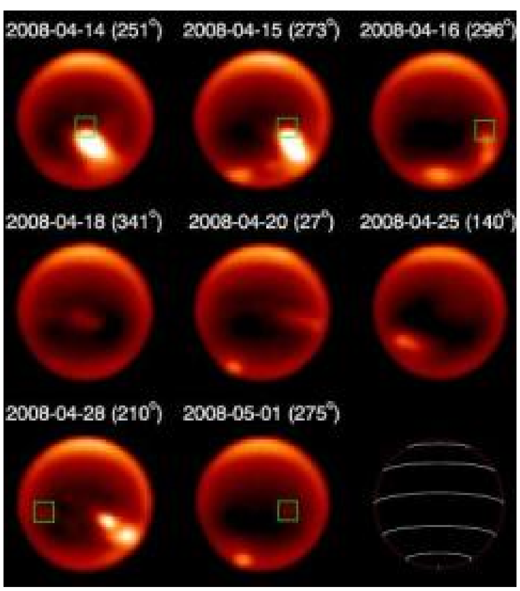
That's just what Emily Schaller—then a graduate student of Brown's—and colleagues accomplished when they observed, in April 2008, a large system of storm clouds appear in the apparently dry mid-latitudes and then spread in a southeastward direction across the moon. Eventually, the storm generated a number of bright but transient clouds over Titan's tropical latitudes, a region where clouds had never been seen—and, indeed, where it was thought they were extremely unlikely to form.

Schaller, now a Hubble Postdoctoral Fellow at the University of Arizona, Brown, and their colleagues; Henry Roe, a former Caltech postdoctoral scholar in Brown's group, now at the Lowell Observatory in Flagstaff; and Tapio Schneider, a professor of environmental science and engineering at Caltech, describe their work, and its implications for climate on Titan, in the August 13 issue of *Nature*.

"A couple of years ago, we set up a highly efficient system on a smaller telescope to figure out when to use the biggest telescopes," Brown says. The first telescope, NASA's Infrared Telescope Facility, on Mauna Kea, takes a spectrum of Titan almost every single night. "From that we can't tell much, but we can say 'no clouds,' 'a few clouds,' or, if we get lucky 'monster clouds,'" he explains.

Schaller explains, "The period during which I was collecting data for my thesis, sadly, corresponded entirely to an extended period of essentially no clouds, so we never really got to show the full power of the combined telescopes. But then, after finishing and turning in my thesis, I walked back across campus to my office to look at the data from the previous night to find that Titan suddenly had the biggest clouds ever. I like to think it was Titan's graduation gift to me. Or perhaps a bad joke."

The day after the telescope's big find (and Schaller's thesis submission), Schaller, Brown, and Roe began tracking the clouds with the large Gemini telescope on Mauna Kea and watched this system evolve for a month. "And what a cool show it was," Brown says.



A major storm erupts in the desert tropics of Titan. Credit: Emily Schaller et al./Gemini Observatory

"The first cloud was seen near the tropics and was caused by a still-mysterious process, but it behaved almost like an explosion in the atmosphere, setting off waves that traveled around the planet, triggering their own clouds. Within days a huge cloud system had covered the south pole, and sporadic clouds were seen all the way up to the equator."

Schneider, an expert on atmospheric circulations, was instrumental in helping to sort out the complicated chain of events that followed the initial outburst of cloud activity.

"The monthlong event has many important implications for understanding the hydrological cycle on Titan," says Brown, "but one of the reasons I am most excited about it is that it shows clouds near the equator—where the [European Space Agency's] Huygens probe landed—for the first time. For a while now, people have speculated that the equatorial regions are simply too dry to ever have significant clouds."

And yet, the images snapped by the Huygens probe in January 2005, as it descended through Titan's soupy atmosphere and toward the surface, revealed small-scale channels and streams, which looked just like features created by fluids—by water, here on Earth, and on Titan, probably by liquid methane.

Experts had speculated for years on how there could be streams and channels in a region with no rain. The new results suggest those speculations may prove unneccessary. "No one considered how storms in one location can trigger them in many other locations," says Brown.

More information: The paper, "Storms in the tropics of Titan," appears in the August 13 issue of *Nature*.

Source: California Institute of Technology (news : web)