Titan Images Seem To Hold Water
Probe Suggests Moon Has Sludgy Surface

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DARMSTADT, Germany, Jan. 15 -- It is a desperately cold, forbidding landscape, where water ice becomes fist-size chunks of stone, but scientists said Saturday that Saturn's remote moon Titan may have one thing found nowhere else in the solar system besides Earth -- lakes and rivers.

"I'm just staggered by the level of detail," said European Space Agency science chief David Southwood, examining images of Titan captured by the agency's Huygens space probe just a day earlier. "It's the only other place where there might be lakes and rivers -- right now."

Southwood was one of scores of exhausted but exultant scientists who took a first glance at the near-flawless data returned by Huygens as it parachuted 789 miles through Titan's smoggy atmosphere and came to rest on a rock-strewn plain bathed in orange twilight.

All six of Huygens's instruments functioned perfectly, and although a software glitch stymied transmission of data about Titan's winds, 18 Earth-based radio telescopes on four continents were able to eavesdrop on the probe's signals and will collaborate to reproduce the experiment.

As a result, said Huygens project manager Jean-Pierre Lebreton, "we have received a very good data set that will allow us to realize all our goals."

Scientists have long coveted the opportunity to see Titan up close, but until Huygens's spectacular voyage, they have been frustrated by a cloud of methane-laced nitrogen that obscures the moon's surface.

The nitrogen, the hydrocarbons and the presence of water ice have transformed Titan -- the second largest moon in the solar system -- into a cold-storage system -- into a cold-storage...
laboratory mimicking many of the conditions that probably existed on Earth before life evolved.

Forcing Titan to surrender its secrets was a principal goal when NASA and the European and Italian space agencies launched the Cassini-Huygens spacecraft in 1997 on a voyage of exploration to Saturn, its rings and seven of its 33 known moons.

Cassini, with Huygens riding piggyback, went into orbit around Saturn last June 30, and on Christmas Eve sent the 700-pound probe on a three-week transit to Titan that culminated in a two-hour, 27-minute parachute drop to the moon's frigid surface. By early afternoon Friday, Huygens had relayed all of its information to Cassini for retransmission to the European Space Operations Centre in this Frankfurt suburb.

On Saturday, scientists stressed that months or even years will elapse before researchers can thoroughly digest Huygens's mountain of data, but a vague sketch of this remote wilderness began to emerge.

The methane haze, which gives Titan a green-blue cast at higher altitudes, turns the sky bright orange at ground level, spectrographic data taken by Huygens showed. Surface temperatures were 291 degrees below zero Fahrenheit, as predicted, with a low temperature of 333 degrees below zero recorded during the descent.

The imaging team presented its first panoramic view of Titan's surface Saturday, showing a broad expanse of what looked like coastline, crags and sludgy, glacier-like deposits that could pass for a harbor in Earth's polar reaches.

"It's almost impossible to resist the interpretation that this is some kind of drainage channel," imaging team leader Marty Tomasko told reporters, pointing to a fjord-like gorge running through the middle of the picture.

But, he said later, "you have to be careful, because we're biased by the things we see on Earth." The "sea" in the panorama may not be liquid, but instead a mushy hydrocarbon slush the color and consistency of wet clay, he said.

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This view jibed with information collected by the "penetrometer," which showed the probe had punched through a six-inch overlying crust before coming to a final stop. The resistance was consistent with "wet sand or clay," said John Zamecki, the surface science team leader.

Tomasko said he suspected that Huygens's resting place would turn out to be a dark spot in the panorama, and the stony landscape, which he had earlier described as littered with "ice boulders," was probably a mix of wet clay and fist-size ice stones, which had appeared larger in the first close-up image.

An early Friday photo suggesting a treachry lava flow fit neatly into Saturday's panorama, suggesting a glacier-like wall of sludge moving toward the "coastline." A white band framing the junction of coast and ocean could indicate some sort of "ground fog," Tomasko noted.

All of this suggested that Titan's surface is a shifting, oozing combination of gravel, stones, hydrocarbon sludge and, possibly, ethane lakes or ponds.

"There's weather," Southwood said. "It's unlike any other place except Earth." There was, however, no lightning or thunder, as Huygens's microphone picked up little but white noise.

Both Tomasko and the University of Michigan's Sushil Atreya, a member of the gas chromatography team, confirmed that the methane smog of the upper atmosphere dissipated a bit less than 12 miles above Titan's surface. Atreya said, however, that methane concentrations surged again at ground level, indicating a possible methane reservoir on the surface.

Southwood said the European Space Agency would conduct an investigation of why Huygens' computers failed to get one of the two transmission channels to turn on, stressing that the mishap had nothing to do with Cassini or the probe's landing site.
The channel's failure caused the loss of all data from the wind experiment, but everything else was duplicated on the functioning channel. Tomasko's team had tried to double the payoff by sending a second set of 350 bonus images on the bad channel, but lost them because of the communications problem.

The wind experiment was saved, however, when astronomers working with 18 radio telescopes in Australia, China, Japan, the United States and Europe captured Huygens's transmission signal and held it until the probe's batteries died hours later, passing the torch around the world as the Earth rotated.

"We are going to recover the scientific value for this experiment in full," said Leonid Gurvits, who managed the collaboration. He acknowledged later, however, that "the amount of data is enormous," and the job "will take weeks."