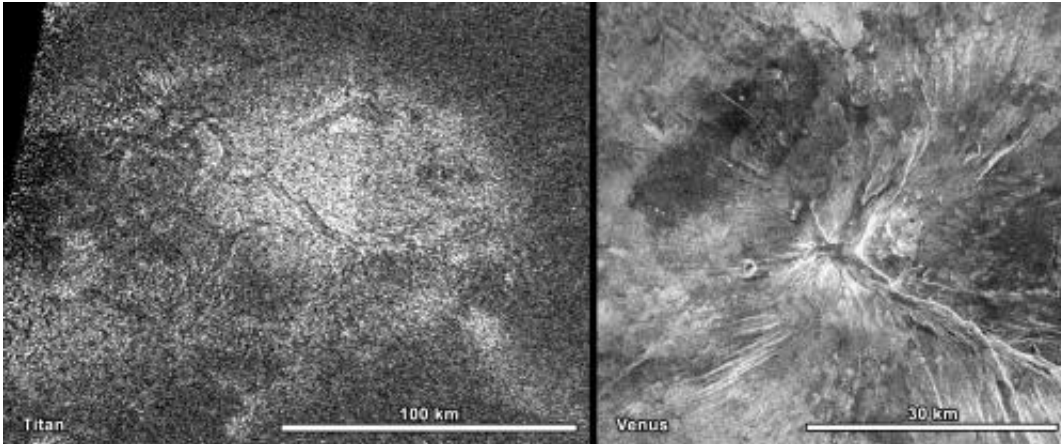


What's baking on Saturn's moon Titan?

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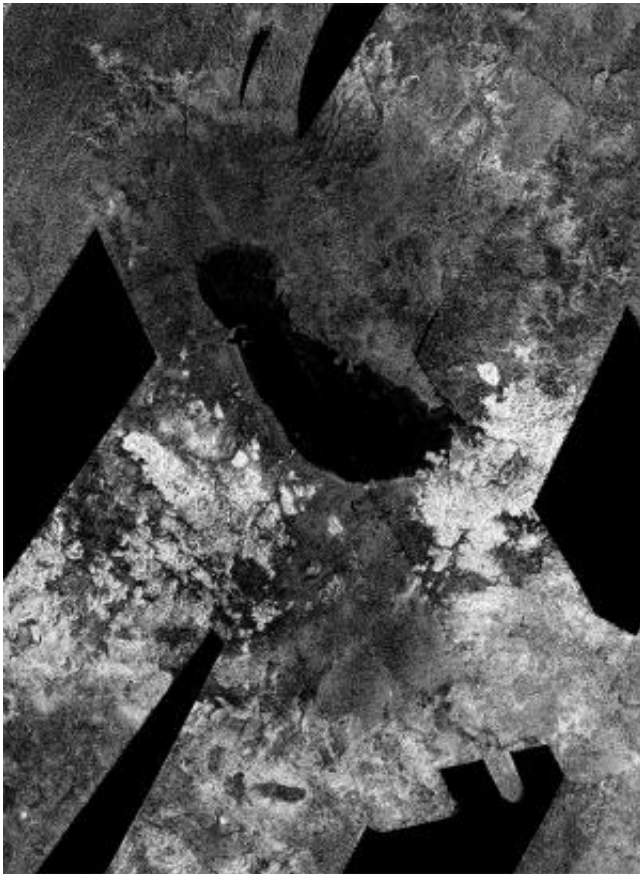


NASA's Cassini spacecraft obtained this image of a feature shaped like a hot cross bun in the northern region of Titan (left) that bears a striking resemblance to a similar feature on Venus (right). The Titan image was obtained by Cassini's radar instrument on May 22, 2012. The bun is located at about 38.5 degrees north latitude and 203 degrees west longitude. This image is taken from a longer radar swath, which is about 3,200 miles (5,200 kilometers) long and about 400 miles (600 kilometers) at its widest. The circular feature shown, which looks like a giant hot cross bun, is about 43 miles (70 kilometers) in diameter with near-perpendicular markings about 37 miles (60 kilometers) wide, meeting at its center. The illumination for this synthetic aperture radar image is from the right. Similar features are seen on other planets. In a synthetic aperture radar image of Venus by NASA's Magellan spacecraft, this radar-bright circular-shaped region of 20 miles (30 kilometers) across lies at the summit of a large volcano called Kunapipi Mons (at about 33.3 degrees south latitude and 85.5 degrees west longitude on Venus). This comparison leads to the interpretation that the Titan crosses are also fractures caused by uplift from below. Steam often causes the top of bread to lift and stretch, but on Titan some other force, such as rising cryomagma, may have uplifted the surface, leading to the crossed cracks. Credit: NASA

(Phys.org)—Radar images from NASA's Cassini spacecraft reveal some new curiosities on the surface of Saturn's mysterious moon Titan, including a nearly circular feature that resembles a giant hot cross bun and shorelines of ancient seas. The results were presented today at the American Astronomical Society's Division of Planetary Sciences conference in Reno, Nev.

Steam from baking often causes the top of bread to lift and crack. Scientists think some similar process involving heat may be at play on [Titan](#). The image showing the bun-like mound was obtained on May 22, 2012, by Cassini's [radar instrument](#). Scientists have seen similar terrain on Venus, where a dome-shaped region about 20 miles (30 kilometers) across has been seen at the summit of a large volcano called Kunapipi Mons. They theorize that the Titan cross, which is about 40 miles (70 kilometers) long, is also the result of fractures caused by uplift from below, possibly the result of rising magma.

"The 'hot cross bun' is a type of feature we have not seen before on Titan, showing that Titan keeps surprising us even after eight years of observations from Cassini," said Rosaly Lopes, a Cassini radar team scientist based at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The 'bun' may be the result of what is known on Earth as a laccolith, an intrusion formed by magma pushing up from below. The Henry Mountains of Utah are well-known examples of this geologic phenomenon."

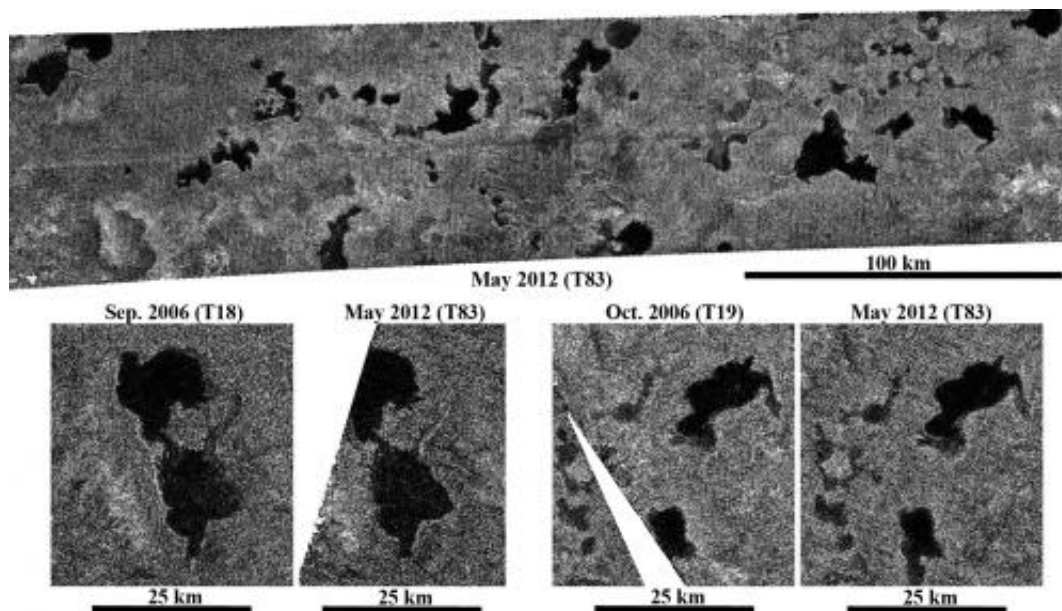


This image from NASA's Cassini spacecraft shows an ancient southern sea that used to sprawl out near the south pole of Saturn's moon Titan. In an annotated version, the red outline traces the ancient shoreline. Within this basin is the largest present-day lake in Titan's southern hemisphere, Ontario Lacus. Ontario Lacus appears black, indicating it is filled with liquid. This image was obtained by Cassini's radar instrument on July 2009 and January 2010. Several images have been stitched together. By analyzing these images, scientists estimate the ancient sea was possibly as large as 300 by 170 miles (475 by 280 kilometers) across and likely less than a few hundred feet (meters) deep. Ontario Lacus is about 80 by 235 kilometers across, and probably at least 30 feet (10 meters) deep at its center. Seas may have covered large parts of the southern hemisphere less than 50,000 years ago. Credit: NASA

Another group of Cassini scientists, led by Ellen Stofan, who is based at Proxemy Research, Rectortown, Va., has been scrutinizing [radar images](#)

of Titan's [southern hemisphere](#). Titan is the only place other than Earth that has stable liquid on its surface, though the liquids on Titan are hydrocarbon rather than water. So far, vast seas have only been seen in Titan's [northern hemisphere](#).

A new analysis of Cassini images collected from 2008 to 2011 suggests there were once vast, shallow seas at Titan's south pole as well. Stofan and colleagues have found two good candidates for dry or mostly dry seas. One of these dry seas appears to be about 300 by 170 miles (475 by 280 kilometers) across, and perhaps a few hundred feet (meters) deep. Ontario Lacus, the largest current lake in the south, sits inside of the dry shorelines, like a shrunken version of a once-mighty sea.



These images obtained by NASA's Cassini spacecraft show Titan's stable northern lake district. Cassini's radar instrument obtained the recent images on May 22, 2012. It observed some previously unseen regions but also some regions containing lakes that were last observed about six years--nearly one Titan season--ago. This marks the longest time interval between lake observations in the northern hemisphere. The top image here shows part of the radar swath from May 22, 2012, centered near 79 degrees north latitude, 58 degrees west

longitude, and about 220 by 47 miles (350 by 75 kilometers) in dimension. At the bottom, parts of this image are compared with those obtained in 2006. (The images appear slightly different from previous releases because they use a new filtering technique). In 2006, it was winter in the northern hemisphere and the lakes were in the dark. Although Titan spring began in 2009 and the sun has now risen over the lakes, there is no apparent change in lake levels since the 2006 flybys, consistent with climate models that predict stability of liquid lakes over several years. This shows that the northern lakes are not transient weather events, in contrast to the temporary darkening of parts of the equator after a rainstorm in 2010 (PIA 12819). Changes in lake levels may still be detected later in the mission as Cassini continues to observe these high northern latitudes into the beginning of summer in 2017. At that point, the sun may cause evaporation. However, the lack of significant change over six years sets important constraints for climate models and the stability of liquids on Titan. Illumination is coming from the bottom. Credit: NASA

Scientists led by Oded Aharonson, another radar team member based at the California Institute of Technology in Pasadena, think that cycles analogous to Earth's Croll-Milankovich cycles, which explain climate changes in terms of the way Earth orbits around the sun, are at play on Titan, too. Such cycles on Titan would cause long-term transfer of liquid hydrocarbons from pole to pole. By this model, the south pole could have been covered with extensive seas less than 50,000 years ago.

"The seas on Titan are temporary hosts for experiments in prebiotic chemistry, and we know they are cycling from one hemisphere to the other over 100,000 years," said Stofan. "I'd love to get a closer look at the seas of the north or these dry seabeds to examine the extent to which this prebiotic chemistry has developed."

The Cassini team has confirmed some of the stability of Titan's northern seas by looking at radar images from Cassini taken about one Titan

season (in this case, six Earth years) apart. The newer images, from May 22, 2012, on the same flyby as the hot cross bun images, show the shorelines stayed about the same, indicating the northern lakes are not transient weather events, in contrast to the temporary darkening of parts of the equator after a rainstorm in 2010.

Provided by JPL/NASA

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