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1.0 Cassini Tracks Clouds Developing Over a Titan Sea

NASA's Cassini spacecraft recently captured images of clouds moving across the northern hydrocarbon seas of Saturn's moon Titan. This renewed weather activity, considered overdue by researchers, could finally signal the onset of summer storms that atmospheric models have long predicted. A movie showing the clouds' movement is available at: [http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA18420](http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA18420)

The Cassini spacecraft obtained the new views in late July, as it receded from Titan after a close flyby. Cassini tracked the system of clouds developing and dissipating over the large methane sea known as Ligeia Mare for more than two days. Measurements of cloud motions indicate wind speeds of around 7 to 10 mph (3 to 4.5 meters per second). For several years after Cassini's 2004 arrival in the Saturn system, scientists frequently observed cloud activity near Titan's south pole, which was experiencing late summer at the time. Clouds continued to be observed as spring came to Titan's northern hemisphere. But since a huge storm swept across the icy moon's low latitudes in late 2010, only a few small clouds have been observed anywhere on the icy moon. The lack of cloud activity has surprised researchers, as computer simulations of Titan's atmospheric circulation predicted that clouds would increase in the north as summer approached, bringing increasingly warm temperatures to the atmosphere there. "We're eager to find out if the clouds' appearance signals the beginning of summer weather patterns, or if it is an isolated occurrence," said Elizabeth Turtle, a Cassini imaging team associate at the Johns Hopkins University Applied Physics Lab in Laurel, Maryland. "Also, how are the clouds related to the seas? Did Cassini just happen catch them over the seas, or do they form there preferentially?"

A year on Titan lasts about 30 Earth years, with each season lasting about seven years. Observing seasonal changes on Titan will continue to be a major goal for the Cassini mission as summer comes to Titan's north and the southern latitudes fall into winter darkness. The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory (JPL) in Pasadena, California, manages the mission for NASA's Science Mission Directorate in Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team consists of scientists from the United States, England, France and Germany. The imaging team is based at the Space Science Institute in Boulder, Colorado.

Source: [NASA JPL](http://www.jpl.nasa.gov)
Heading toward a speedy encounter next summer, NASA's New Horizons spacecraft has glimpsed Pluto and its moon Charon in a cosmic orbital dance from a distance of more than 260 million miles. Recorded over five days in July, the images show Charon completing one orbit of Pluto. Charon orbits approximately 11,200 miles from Pluto. Pluto's smaller moons -- Nix, Hydra, Styx and Kerberos -- are too faint to see with the camera on New Horizons. Scientists say they will come into view as the probe nears Pluto next year. The Long Range Reconnaissance Imager, or LORRI, instrument on New Horizons took the pictures used in the short movie. Ground controllers commanded the spacecraft to take the images as part of the mission's first optical navigation campaign, which is used to ensure New Horizons flies at the correct distance from Pluto during a high-speed flyby on July 14, 2015. The encounter of Pluto by New Horizons will give scientists their first close-up view of the distant world. The probe's images of Pluto and its moons will become better than the best views possible with the Hubble Space Telescope early next year. "The image sequence showing Charon revolving around Pluto set a record for close range imaging of Pluto -- they were taken from 10 times closer to the planet than the Earth is," said Alan Stern, New Horizons principal investigator from the Southwest Research Institute in Boulder, Colo. "But we'll smash that record again and again, starting in January, as approach operations begin." Launched in January 2006, New Horizons will cross the orbit of Neptune on Aug. 25, then enter the last in a series of deep space hibernations Aug. 29. "We are really excited to see our target and its biggest satellite in motion from our own perch, less than a year from the historic encounter ahead!" New Horizons will wake up in December before starting long range encounter operations Jan. 4.
Curiosity has zapped hundreds of Red Planet rocks with her powerful laser blaster during her lifetime and has now caught the sparks flying for the first time as they happened – as seen in new photos and video above and below released this week by NASA. As the NASA rover's million watt Chemistry and Camera (ChemCam) instrument fired multiple laser shots at a rock fortuitously named “Nova” the team commanded her arm-mounted Mars Hand Lens Imager (MAHLI) high resolution imaging camera to try and capture the action as it occurred, for the first time. And they succeeded. Curiosity blasted the baseball sized “Nova” rock target over 100 times on July 12, 2014, or Sol 687. Since the nail biting touchdown nearly two years ago on Aug. 5, 2012 inside Gale Crater, ChemCam has aimed the laser instrument at more than 600 rock or soil targets and fired more than 150,000 laser shots. ChemCam is used to determine the composition of Martian rocks and soils at a distance of up to 25 feet (8 meters) yielding preliminary data for the scientists and engineers to decide if a target warrants up close investigation and in rare cases sampling and drilling activities. ChemCam works through a process called laser-induced breakdown spectroscopy. The laser hits a target with pulses to generate sparks, whose spectra provide information about which chemical elements are in the target. Successive laser shots are fired in sequence to gradually blast away thin layers of material. Each shot exposes a slightly deeper layer for examination by the ChemCam spectrometer. As Curiosity fired deeper into “Nova” it showed an increasing concentration of aluminum as the sequential laser blasts penetrated through the uninteresting dust on the rock’s surface. Silicon and sodium were also detected. “This is so exciting! The ChemCam laser has fired more than 150,000 times on Mars, but this is the first time we see the plasma plume that is created,” said ChemCam Deputy Principal Investigator Sylvestre Maurice, at the Research Institute in Astrophysics and Planetology, of France's National Center for Scientific Research and the University of Toulouse, France, in a statement. “Each time the laser hits a target, the plasma light is caught and analyzed by ChemCam's spectrometers. What the new images add is confirmation that the size and shape of the spark are what we anticipated under Martian conditions.” The SUZ sized rover is driving as swiftly as possible to the base of Mount Sharp which dominates the center of Gale Crater and reaches 3.4 miles (5.5 km) into the Martian sky – taller than Mount Rainier. During Year 1 on Mars, Earth’s emissary has already accomplished her primary objective of discovering a habitable zone on the Red Planet that contains the minerals necessary to support microbial life in the ancient past when Mars was far wetter and warmer billions of years ago. To date, Curiosity's odometer totals over 5.1 miles (8.4 kilometers) since landing inside Gale Crater on Mars in August 2012. She has taken over 166,000 images. Curiosity still has about another 2.4 miles (3.9 kilometers) to go to reach the entry way at a gap in the treacherous sand dunes at the foothills of Mount Sharp sometime later this year.
The Night Sky

Tuesday, August 19
If you're in the Earth's mid-northern latitudes, bright Vega passes close by your zenith just as night becomes fully dark. Whenever you see Vega at its closest to straight up, you know that Sagittarius, with its deep-sky riches, is at its highest in the south.

Wednesday, August 20
Roam the deep-sky sights just above the Sagittarius Teapot pattern with Sue French's "Deep-Sky Wonders" guided tour in the August Sky & Telescope, page 56. Do you know the Summer Christmas Tree?

Thursday, August 21
As soon as the stars come out, the Great Square of Pegasus stands low in the east. It's balancing on one corner, and your fist at arm's length fits inside it. It rises higher through the evening and floats highest overhead around 2 or 3 a.m.

Friday, August 22
Altair is the brightest star halfway up the southeastern sky after nightfall. Look to its left, by a little more than a fist at arm's length, for the dim but distinctive constellation Delphinus, the Dolphin. He's leaping to the left, just below the Milky Way.

Saturday, August 23
August is prime Milky Way time. After dark, the Milky Way runs from Sagittarius and Scorpius in the south-southwest, up and left across Aquila and through the big Summer Triangle very high in the southeast and east, and on down through Cassiopeia to Perseus rising low in the north-northeast.

Source: Sky & Telescope

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ISS Sighting Opportunities
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Sighting information for other cities can be found at NASA’s Satellite Sighting Information

NASA-TV Highlights
(all times Eastern Daylight Time)

10:45 a.m., Tuesday, August 19 - ISS Expedition 40 In-Flight Event (all channels)

5:30 p.m., Wednesday, August 20 - NASA, National Science Foundation and the Smithsonian Institution Present “Ancient Earth, Alien Earth” – How Earth History Teaches Us about Planets Orbiting Other Stars (all channels)

TBD, Friday, August 22 - ISS Expedition 40 In-Flight Event for ESA with Flight Engineer Alexander Gerst (all channels)

8:50 a.m., Friday, August 22 - ISS Expedition 40 In-Flight Event for ESA with Flight Engineer Alexander Gerst (all channels)

8:55 a.m., Friday, August 22 - ISS Expedition 40 In-Flight Event for ESA with Flight Engineer Alexander Gerst (all channels)

Watch NASA TV online by going to the NASA website.

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Space Calendar

- Aug 19 - Gaofen 2 (GF 2) Heweliusz CZ-4B Launch
- Aug 19 - Comet C/2014 M3 (Catalina) At Opposition (1.555 AU)
- Aug 19 - Comet 202P/Scotti At Opposition (3.132 AU)
- Aug 19 - Comet C/2012 K8 (Lemmon) Perihelion (6.463 AU)
- Aug 19 - Asteroid 2014 OA339 Near-Earth Flyby (0.051 AU)
- Aug 19 - Asteroid 5102 Benfranklin Closest Approach To Earth (1.365 AU)
- Aug 19 - Asteroid 21564 Widmanstatten Closest Approach To Earth (1.720 AU)
- Aug 19 - Asteroid 12561 Howard Closest Approach To Earth (2.340 AU)
- Aug 19 - Asteroid 39382 Opportunity Closest Approach To Earth (3.008 AU)
- Aug 20 - Comet C/2011 S1 (Gibbs) Perihelion (6.897 AU)
- Aug 20 - Asteroid 3 Juno Occults 2UCAC 36260012 (11.1 Magnitude Star)
- Aug 20 - Asteroid 3656 Hemingway Closest Approach To Earth (1.083 AU)
- Aug 21 - Cassini, Titan Flyby
- Aug 21 - Comet 307P/LINEAR At Opposition (1.235 AU)
- Aug 21 - Comet P/2007 S1 (Zhao) Closest Approach To Earth (1.962 AU)
- Aug 21 - Asteroid 2014 OV3 Near-Earth Flyby (0.060 AU)
- Aug 21 - Asteroid 1862 Apollo Closest Approach To Earth (0.373 AU)
- Aug 21 - Asteroid 100267 JAXA Closest Approach To Earth (1.391 AU)
- Aug 21 - Asteroid 16035 Sasandford Closest Approach To Earth (1.565 AU)
- Aug 22 - Galileo FM1 & FM2 Soyuz 2-1B-Fregat Launch
- Aug 22 - Comet 19P/Borrelly Closest Approach To Earth (2.220 AU)
- Aug 22 - Asteroid 5143 Heracles Closest Approach To Earth (0.843 AU)
- Aug 22 - 30th Anniversary (1984), Tomiya Meteorite Fall (Hit Houses in Japan)
- Aug 23 - Comet 303P/NEAT At Opposition (1.510 AU)
- Aug 23 - Asteroid 2559 Svboda Occults HIP 23583 (6.2 Magnitude Star)
- Aug 23 - Asteroid 2100 Ra-Shalom Closest Approach To Earth (1.337 AU)
- Aug 23 - Asteroid 3769 Arthurmiller Closest Approach To Earth (1.388 AU)
- Aug 23 - Asteroid 293934 MP1A Closest Approach To Earth (1.459 AU)
- Aug 23 - Asteroid 3061 Cook Closest Approach To Earth (1.490 AU)
- Aug 23 - Asteroid 17656 Hayabusa Closest Approach To Earth (1.586 AU)
- Aug 23 - Centaur Object 7066 Nessus At Opposition (24.966 AU)
- Aug 23 - Kuiper Belt Object 307982 (2004 PG115) At Opposition (36.536 AU)

Source: JPL Space Calendar
Food for Thought

How Will Earth’s Leaders Respond to a Real Asteroid Threat?

Asteroids have pounded Earth in the past and will continue to do so in the future. If a big one lines the planet up in its crosshairs, civilization itself could be imperiled. Now, the United Nations Committee on the Peaceful Uses of Outer Space has taken a step toward combating the asteroid threat. A special U.N. action team on near-Earth objects (NEOs) has recommended the creation of an International Asteroid Warning Network (IAWN), which is designed to gather and analyze NEO data and provide timely warnings to national authorities if a potentially hazardous NEO were to threaten Earth.

A number of components of an IAWN already exist and are working together. Now, the objective is to pool together the expertise of the world’s many relevant scientific organizations, to discover and track objects and generate early warnings of potential impacts. Secondly, a Space Mission Planning Advisory Group (SMPAG) has been meeting to plan for the possibility of a future asteroid impact. The group includes representatives of spacefaring nations and other pertinent organizations. One key goal of SMPAG is to promote opportunities for international collaboration on research and techniques for asteroid deflection. Once established, IAWN and SMPAG will be independent of the UN and will only inform the UN's Scientific and Technical Subcommittee on a yearly basis on the work that they carry out. While the UN has not taken any bureaucratic steps, the recommendations for an international response to an asteroid impact threat — which are leading to the establishment of IAWN and SMPAG — were made by inter-governmental bodies after years of considering interim reports prepared by Action Team-14, reports by national governments and international organizations and statements and technical presentations made during consideration by the UN's Scientific and Technical Subcommittee regarding NEOs.

Wake-up call - The meteor that exploded over Chelyabinsk, Russia, in February 2013 served as a wake-up call for politicians and the public that Earth is not immune to asteroid strikes, experts say. It also set the wheels turning on an action plan to address future impacts. In December 2013, the U.N. General Assembly "welcomed, with satisfaction, the recommendations for an international response to the near-Earth object impact threat." And earlier this year, the Committee on the Peaceful Uses of Outer Space (COPUOS) meeting, held June 11-13 in Vienna, was the scene of noteworthy NEO deliberations. "A few more agencies joined, and we can now say that we have all major players in the space scene onboard the SMPAG, so that's great progress," said Detlef Koschny, the European Space Agency's NEO segment manager in the Netherlands. "We have agreed on what to do next," Koschny told Space.com. "Defining criteria on when to start thinking about a possible deflection mission is one of the points. This is not easy." Those criteria include knowing the location of the impact and an estimate of the expected damage. Researchers would also need to determine the minimum number of people who would have to be in danger for a deflection to be warranted. "But these things are hard to know," Koschny said. "They depend on the composition of the object, which often is not known, and needs very precise orbit computations. These are things we have started addressing." As for the IAWN, Koschny said that the major progress is that the relevant people are being made aware that it exists and that they may be part of the network. The first meeting of the steering committee for IAWN took place in January, he said.

NEO report - Taking part in the UN NEO discussions is Tom Jones, a former NASA astronaut and head of the Association of Space Explorers' (ASE) Committee on Near-Earth Objects. ASE — an international professional
organization for people who have been to space — produced a seminal report back in 2008 entitled "Asteroid Threats: A Call for Global Response," prepared by the group's International Panel on Asteroid Threat Mitigation. ASE's 2008 report was submitted to COPUOS for consideration and subsequent action by the United Nations. The report's goal was to assist the international community in preventing loss of life and property resulting from an asteroid impact on Earth. "Because NEO impacts represent a global, long-term threat to the collective welfare of humanity, an international program and set of preparatory measures for action should be established," the authors of the 2008 report wrote.

Encouraging news - In recounting the recent U.N. actions, Jones said that one important development is that NASA has worked with the Pentagon to release space-based observation data from reconnaissance spacecraft that see blazing bolides and fireballs in the Earth's atmosphere. "Nearly 20 events have been posted to date," Jones told Space.com. NASA's Near Earth Object Observation Program is receiving information on bolide/fireball events "based on analysis of data collected by U.S. government sensors," he added. Regarding SMPAG, Jones said the June U.N. meetings were productive, and that the second meeting of the group was attended by 27 space agency representatives and observers. "We heard encouraging news on a number of international NEO exploration missions," Jones said, "some of which include planned demonstrations of NEO-deflection technologies."

Follow-up steps - Jones said he was encouraged by the cooperation displayed at SMPAG to hammer out the "terms of reference" — the operating rules and mission — of SMPAG. Furthermore, there is enthusiasm for future sessions dealing specifically with the planning of a joint deflection demonstration mission, and various supporting research on preventing an asteroid impact, Jones said. "Along with the International Asteroid Warning Network, SMPAG shows that the world's space agencies are serious about understanding the NEO threat, and in sketching out the rough details of how to deal with an impact," Jones said. He's also optimistic about the follow-up steps. "What I hope will come next is the creation of a true joint-mission program to conduct planetary-defense demonstrations, with invitations to all the space agencies to contribute hardware, funding, experiments and firm policy commitments for a launch within 10 years," Jones said.

Space.com
**Space Image of the Week**

European Cargo Craft Approaches Station for Docking

*Image Credit: NASA*

**Explanation:** The “Georges Lemaitre” Automated Transfer Vehicle (ATV-5), photographed by an Expedition 40 crew member, is about to dock to the aft port of the International Space Station’s Zvezda Service Module. Docking occurred at 8:30 a.m. (CDT) as the ATV and the station flew 260 miles over southern Kazakhstan, following a two-week period of free-flight.

Source: NASA