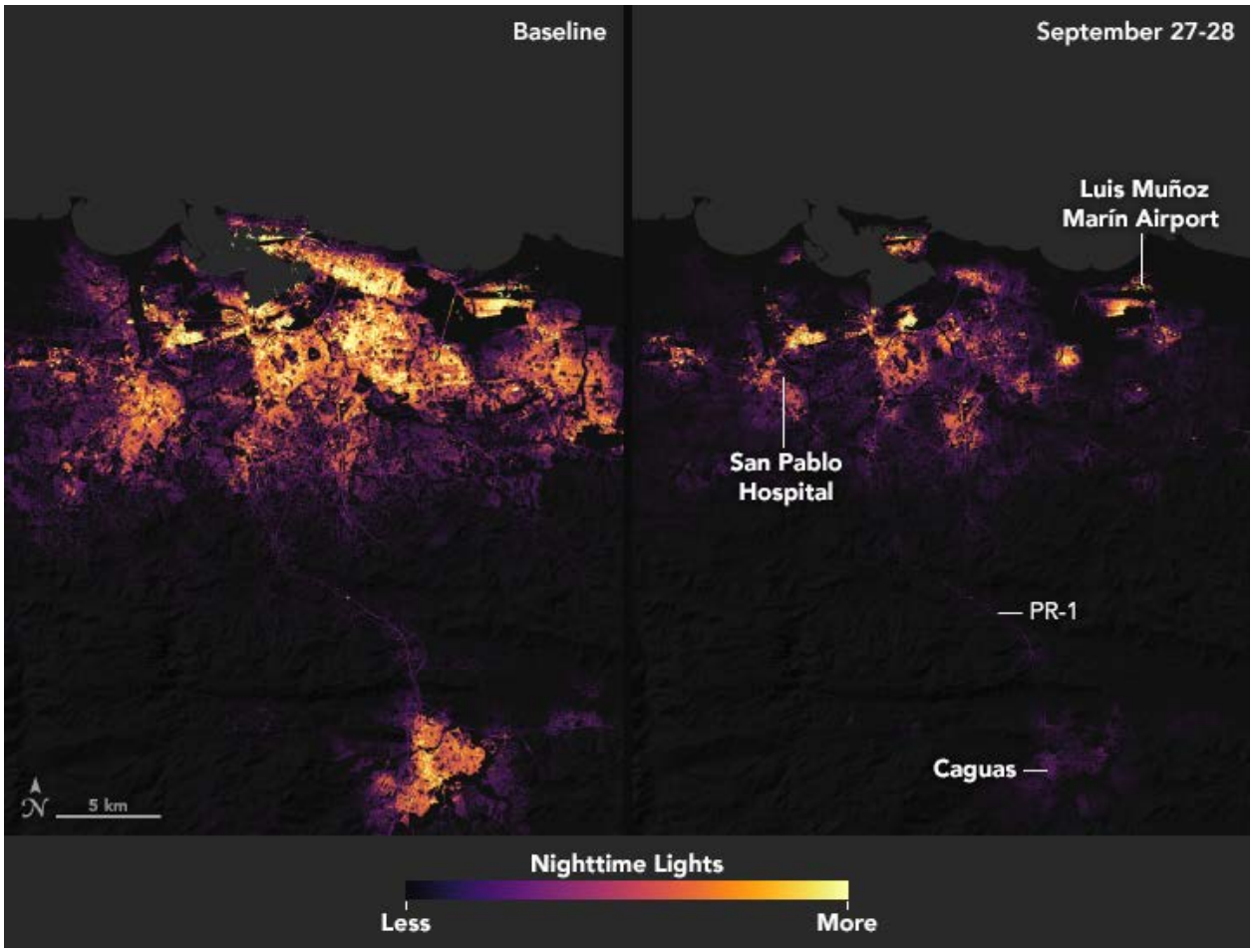
Space News Update

— September 29, 2017 —

Contents

1. Pinpointing Where the Lights Went Out in Puerto Rico

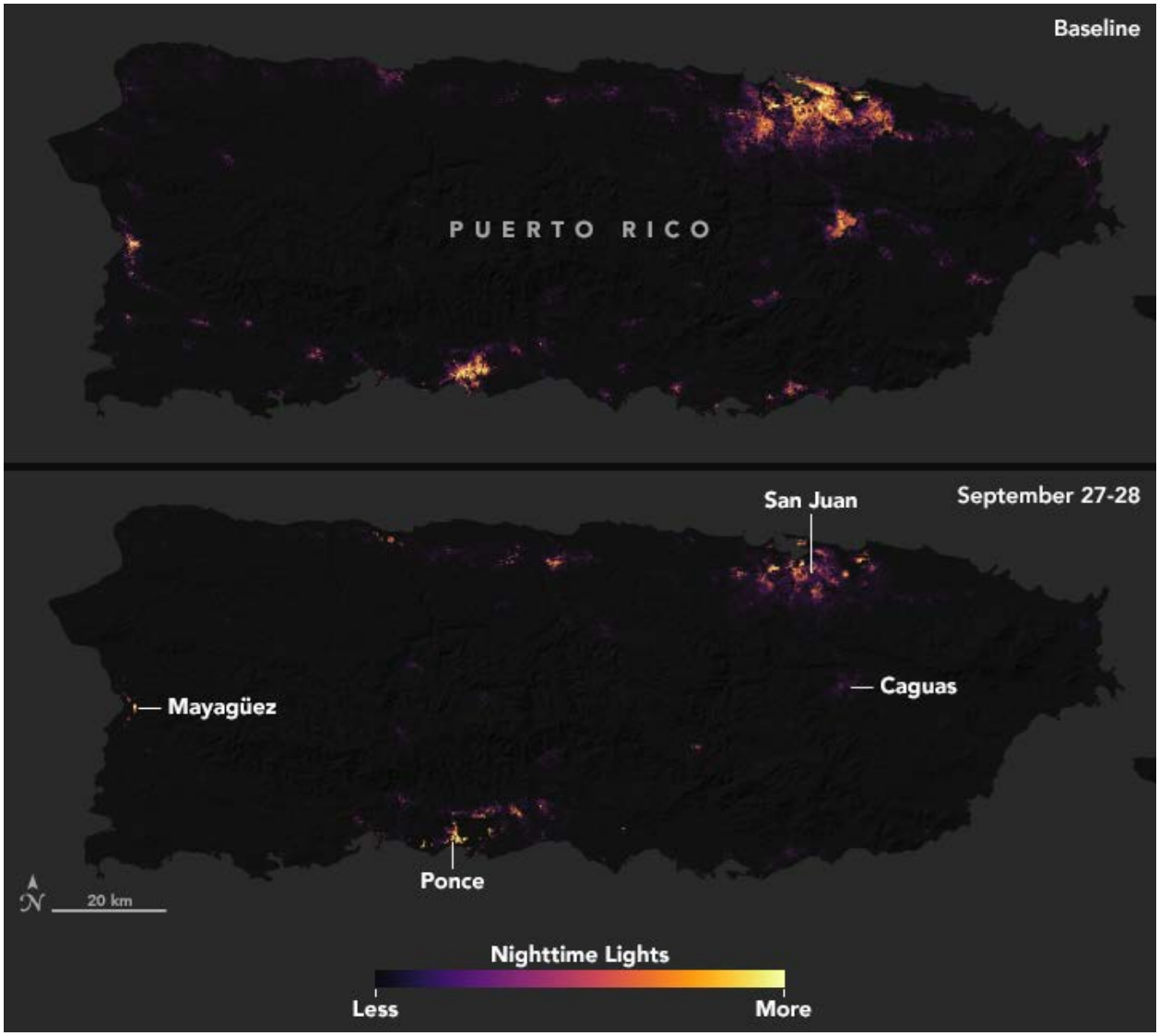


After Hurricane Maria tore across Puerto Rico, it quickly became clear that the destruction would pose daunting challenges for first responders. Most of the electric power grid and telecommunications network was knocked offline. Flooding, downed trees, and toppled power lines made many roads impassable.

In circumstances like this, quickly knowing where the power is out—and how long it has been out—allows first responders to better deploy rescue and repair crews and to distribute life-saving supplies. And that is exactly why teams of scientists at NASA are working long days to make sure that groups like the National Guard and the Federal Emergency Management Agency (FEMA) get high-quality satellite maps of power outages in Puerto Rico.

These before-and-after images of Puerto Rico's nighttime lights are based on data captured by the Suomi NPPsatellite. The data was acquired by the Visible Infrared Imaging Radiometer Suite (VIIRS) "day-night band," which detects light in a range of wavelengths from green to near-infrared, including reflected moonlight, light from fires and oil wells, lightning, and emissions from cities or other human activity.

The images above show lighting around San Juan, capital of the commonwealth; the images below show the entire island. One image in each pair shows a typical night before Maria made landfall, based upon cloud-free and low moonlight conditions; the second image is a composite that shows light detected by VIIRS on the nights of September 27 and 28, 2017. By compositing two nights, the image has fewer clouds blocking the view. (Note: some clouds still blocked light emissions during the two nights, especially across southeastern and western Puerto Rico.) The images above show widespread outages around San Juan, including key hospital and transportation infrastructure.



Note that these maps are not showing raw imagery of light. A team of scientists from NASA's Goddard Space Flight Center and Marshall Space Flight Center processed and corrected the raw data to filter out stray light from the Moon, fires, airglow, and any other sources that are not electric lights. Their processing techniques also remove as much other atmospheric interference—such as dust, haze, and thin clouds—as possible.

To make the VIIRS data more useful to first responders, the Goddard team scaled the observations onto a base map that emphasizes the locations of streets and neighborhoods. The base map makes use of data collected by the Landsat, Sentinel-2, TanDEM-X, and TerraSAR-X satellites. It also incorporates high-resolution data from OpenStreetMap to show the precise locations of streets and neighborhoods.

"It is critical that we get this processing done quickly, so that we can provide the cleanest and most useful imagery to the National Guard, FEMA, and other first responders," said Miguel Román, who is leading the effort from Goddard. "Uncorrected images can be misleading because of things like cloud cover and changing moonlight conditions."

Román's team is also working closely with colleagues from the Short-term Prediction Research and Transition Center (SPoRT) at NASA Marshall, as well as NASA's Earth Science Disasters Program, to develop and share data products with first responders.

“The expertise of the SPoRT team focuses on helping end users make effective decisions from innovative NASA, NOAA, and partner data products,” said Andrew Molthan, co-investigator of the SPoRT Center. “It has been rewarding to work with Goddard colleagues on solutions that can assist with response efforts.”

References and Further Reading

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- Molthan, A. & Jedlovec, G. (2013) Satellite Observations Monitor Outages From Superstorm Sandy. *EOS*, 94 (5), 53-54.
- NASA Earth Observatory (2017, April 12) Black Marble 2017: Night Light Maps Open Up New Applications.
- NASA Earth Observatory (2017) Hurricane Marie 2017.
- *The Boston Globe* (2017, September 25) Damage to Puerto Rico’s power grid is unprecedented. Accessed September 28, 2017.
- U.S. Energy Information Administration (2017, September 21) Puerto Rico. Accessed September 28, 2017.
- Vox (2017, September 6) Why Puerto Rico’s power outages could prove very deadly, in one chart. Accessed September 28, 2017.
- *Wired* (2017, September 27) After Hurricane Maria, Puerto Rico’s Grid Needs a Complete Overhaul. Accessed September 28, 2017.

Source: NASA

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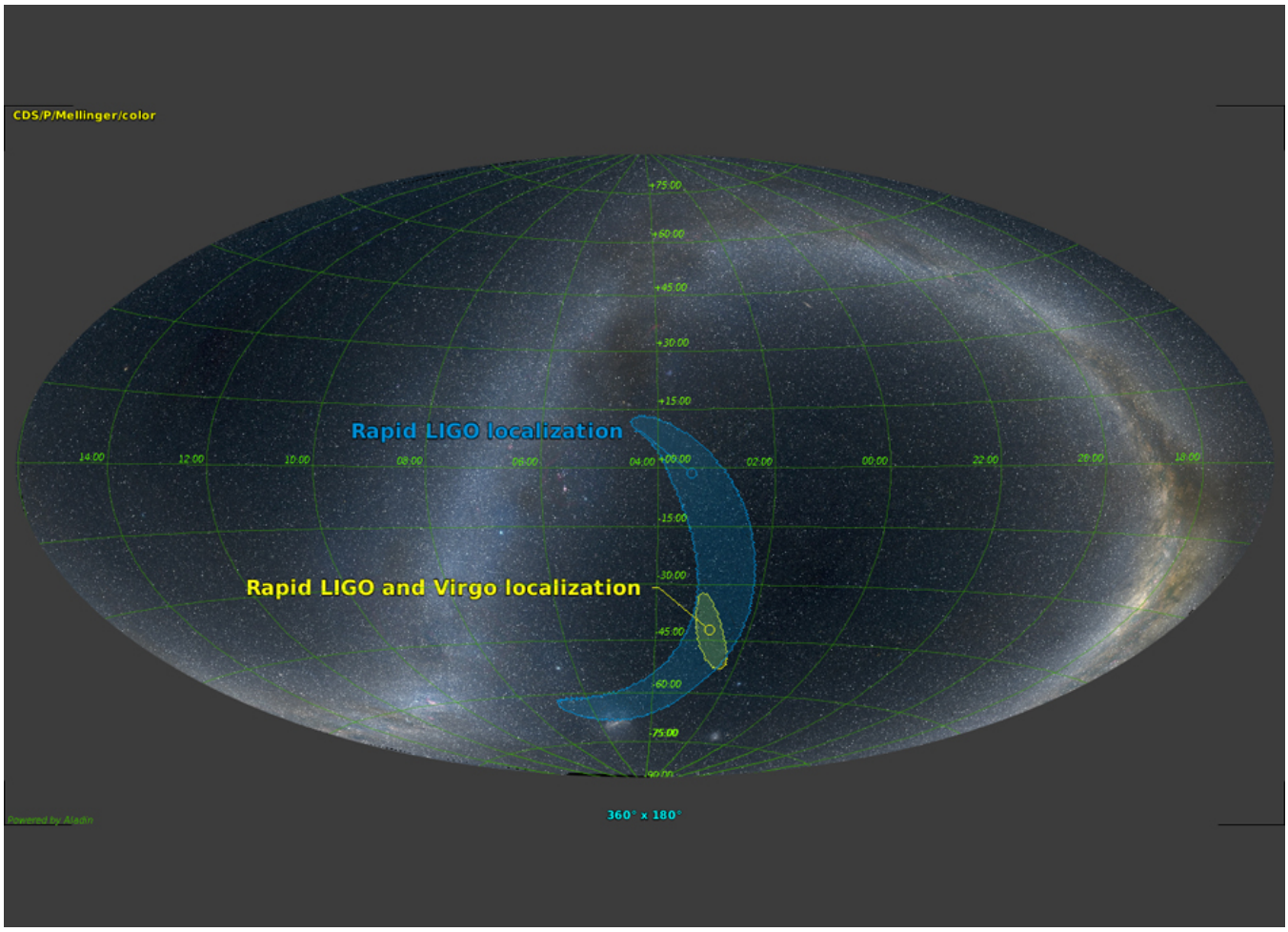
2. Gravitational Waves from Black Hole Merger Observed



The LIGO Scientific Collaboration and the Virgo collaboration report the first joint detection of gravitational waves with both the LIGO and Virgo detectors.

This is the fourth announced detection of a binary black hole system and the first significant gravitational-wave signal recorded by the Virgo detector, and highlights the scientific potential of a three-detector network of gravitational-wave detectors.

The three-detector observation was made on August 14, 2017, at 10:30:43 UTC. The two Laser Interferometer Gravitational-Wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, and funded by the National Science Foundation (NSF), and the Virgo detector, located near Pisa, Italy, detected a transient gravitational-wave signal produced by the coalescence of two stellar mass black holes.

A paper about the event, known as GW170814, has been accepted for publication in the journal Physical Review Letters. Gravitational Waves from Black Hole Merger Observed by LIGO and Virgo

The detected gravitational waves -- ripples in space and time -- were emitted during the final moments of the merger of two black holes with masses about 31 and 25 times the mass of the Sun and located about 1.8 billion light-years away.

The newly produced spinning black hole has about 53 times the mass of our Sun, which means that about 3 solar masses were converted into gravitational-wave energy during the coalescence.

"This is just the beginning of observations with the network enabled by Virgo and LIGO working together," says David Shoemaker of MIT, LSC spokesperson. "With the next observing run planned for Fall 2018 we can expect such detections weekly or even more often."

"It is wonderful to see a first gravitational-wave signal in our brand new Advanced Virgo detector only two weeks after it officially started taking data," says Jo van den Brand of Nikhef and VU University Amsterdam, spokesperson of the Virgo collaboration. "That's a great reward after all the work done in the Advanced Virgo project to upgrade the instrument over the past six years."

"Little more than a year and a half ago, NSF announced that its Laser Gravitational-Wave Observatory had made the first-ever detection of gravitational waves resulting from the collision of two black holes in a galaxy a billion light-years away," says France Córdova, NSF director. "Today, we are delighted to announce the first discovery made in partnership between the Virgo Gravitational-Wave Observatory and the LIGO Scientific Collaboration, the first time a gravitational-wave detection was observed by these observatories, located thousands of miles apart. This is an exciting milestone in the growing international scientific effort to unlock the extraordinary mysteries of our universe."

Advanced LIGO is a second-generation gravitational-wave detector consisting of the two identical interferometers in Hanford and Livingston, and uses precision laser interferometry to detect gravitational waves. Beginning operating in September 2015, Advanced LIGO has conducted two observing runs. The second "O2" observing run began on November 30, 2016, and ended on August 25, 2017.

Advanced Virgo is the second-generation instrument built and operated by the Virgo collaboration to search for gravitational waves. With the end of observations with the initial Virgo detector in October 2011, the integration of the Advanced Virgo detector began. The new facility was dedicated in February 2017 while its commissioning was ongoing. In April, the control of the detector at its nominal working point was achieved for the first time.

The Virgo detector joined the O2 run on August 1, 2017, at 10:00 UTC. The real-time detection on August 14 was triggered with data from all three LIGO and Virgo instruments. Virgo is, at present, less sensitive than LIGO, but two independent search algorithms based on all the information available from the three detectors demonstrated the evidence of a signal in the Virgo data as well.

Overall, the volume of universe that is likely to contain the source shrinks by more than a factor of 20 when moving from a two-detector network to a three-detector network. The sky region for GW170814 has a size of only 60 square degrees, more than 10 times smaller than with data from the two LIGO interferometers alone; in addition, the accuracy with which the source distance is measured benefits from the addition of Virgo.

"This increased precision will allow the entire astrophysical community to eventually make even more exciting discoveries, including multi-messenger observations," says Georgia Tech professor Laura Cadonati, the deputy spokesperson of the LSC. "A smaller search area enables follow-up observations with telescopes and satellites for cosmic events that produce gravitational waves and emissions of light, such as the collision of neutron stars."

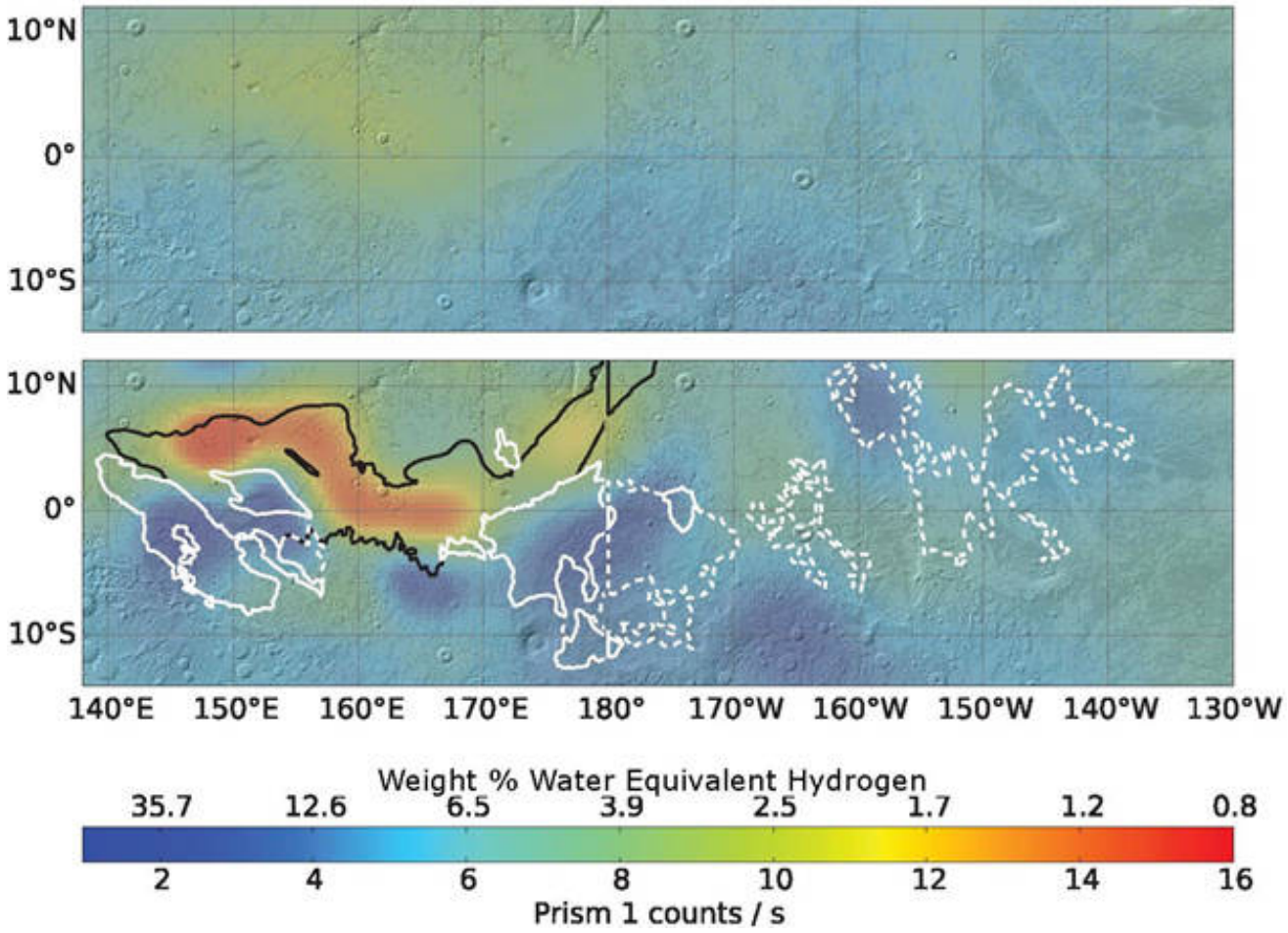
"As we increase the number of observatories in the international gravitational wave network, we not only improve the source location, but we also recover improved polarization information that provides better information on the orientation of the orbiting objects as well as enabling new tests of Einstein's theory," says Fred Raab, LIGO associate director for observatory operations.

LIGO and VIRGO's partner electromagnetic facilities around the world didn't identify a counterpart for GW170814, which was similar to the three prior LIGO observations of black hole mergers. Black holes produce gravitational waves but not light.

"With this first joint detection by the Advanced LIGO and Virgo detectors, we have taken one step further into the gravitational-wave cosmos," says Caltech's David H. Reitze, the executive director of the LIGO Laboratory. "Virgo brings a powerful new capability to detect and better locate gravitational-wave sources, one that will undoubtedly lead to exciting and unanticipated results in the future."

Source: Spaceref.com Return to Contents

3. A Fresh Look at Older Data Yields a Surprise Near the Martian Equator



Scientists taking a new look at older data from NASA's longest-operating Mars orbiter have discovered evidence of significant hydration near the Martian equator -- a mysterious signature in a region of the Red Planet where planetary scientists figure ice shouldn't exist.

Jack Wilson, a post-doctoral researcher at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, led a team that reprocessed data collected from 2002 to 2009 by the neutron spectrometer instrument on NASA's Mars Odyssey spacecraft. In bringing the lower-resolution compositional data into sharper focus, the scientists spotted unexpectedly high amounts of hydrogen -- which at high latitudes is a sign of buried water ice -- around sections of the Martian equator.

An accessible supply of water ice near the equator would be of interest in planning astronaut exploration of Mars. The amount of delivered mass needed for human exploration could be greatly reduced by using Martian natural resources for a water supply and as raw material for producing hydrogen fuel.

By applying image-reconstruction techniques often used to reduce blurring and remove "noise" from medical or spacecraft imaging data, Wilson's team improved the spatial resolution of the data from around 320 miles to 180 miles (520 kilometers to 290 kilometers). "It was as if we'd cut the spacecraft's orbital altitude in half," Wilson said, "and it gave us a much better view of what's happening on the surface."

The neutron spectrometer can't directly detect water, but by measuring neutrons, it can help scientists calculate the abundance of hydrogen -- and infer the presence of water or other hydrogen-bearing substances. Mars Odyssey's first major discovery, in 2002, was abundant hydrogen just beneath the surface at high latitudes. In 2008, NASA's Phoenix Mars Lander confirmed that the hydrogen was in the form of water ice. But

at lower latitudes on Mars, water ice is not thought to be thermodynamically stable at any depth. The traces of excess hydrogen that Odyssey's original data showed at lower latitudes were initially explained as hydrated minerals, which other spacecraft and instruments have since observed.

Wilson's team concentrated on those equatorial areas, particularly with a 600-mile (1,000-kilometer) stretch of loose, easily erodible material between the northern lowlands and southern highlands along the Medusae Fossae Formation. Radar-sounding scans of the area have suggested the presence of low-density volcanic deposits or water ice below the surface, "but if the detected hydrogen were buried ice within the top meter of the surface, there would be more than would fit into pore space in soil," Wilson said. The radar data came from both the Shallow Radar on NASA's Mars Reconnaissance Orbiter and the Mars Advanced Radar for Subsurface and Ionospheric Sounding on the European Space Agency's Mars Express orbiter and would be consistent with no subsurface water ice near the equator.

How water ice could be preserved there is a mystery. A leading theory suggests an ice and dust mixture from the polar areas could be cycled through the atmosphere when Mars' axial tilt was larger than it is today. But those conditions last occurred hundreds of thousands to millions of years ago. Water ice isn't expected to be stable at any depth in that area today, Wilson said, and any ice deposited there should be long gone. Additional protection might come from a cover of dust and a hardened "duricrust" that traps the humidity below the surface, but this is unlikely to prevent ice loss over timescales of the axial tilt cycles.

"Perhaps the signature could be explained in terms of extensive deposits of hydrated salts, but how these hydrated salts came to be in the formation is also difficult to explain," Wilson added. "So for now, the signature remains a mystery worthy of further study, and Mars continues to surprise us."

Wilson led the research while at Durham University in the U.K. His team – which includes members from NASA Ames Research Center, the Planetary Science Institute and the Research Institute in Astrophysics and Planetology – published its findings this summer in the journal Icarus.

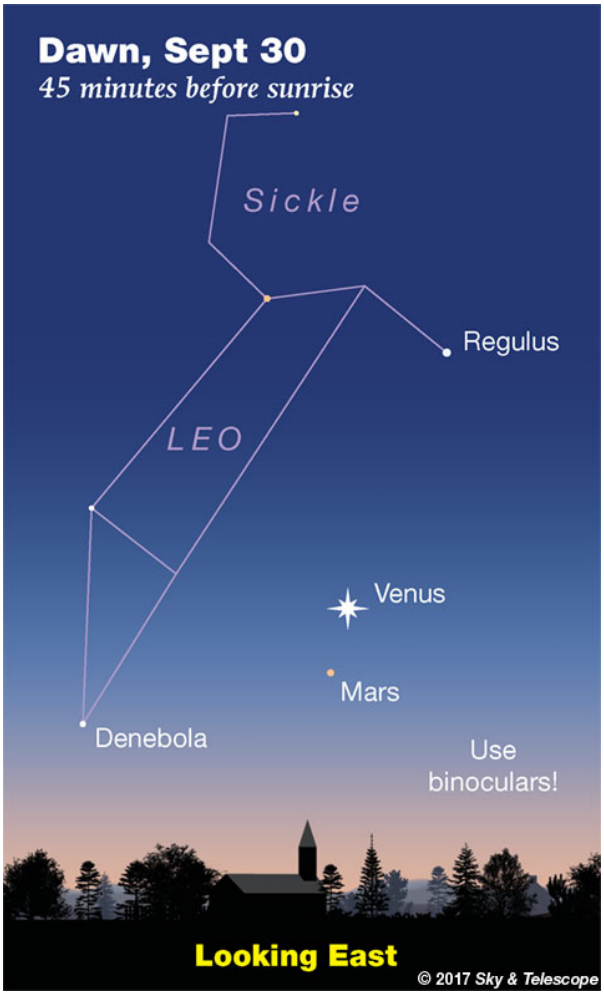
Source: NASA Return to Contents

The Night Sky

Friday, September 29

• As the stars come out in late twilight, look high above the Moon for Altair. Once the sky is dark, examine the sky upper left of Altair for dim little Delphinus, the Dolphin, about a fist at arm's length from it.

A little less far straight above Altair is the smaller, dimmer constellation Sagitta, the Arrow. Binoculars will help.



Saturday, September 30

• Arcturus shines in the west these evenings, sinking as twilight fades away. Equally-bright Capella is rising lower in the north-northeast, depending on your latitude. (The farther north you are the higher it will be.) They're both magnitude 0, as bright as Vega high overhead.

By mid-evening Arcturus and Capella shine at identical heights. When exactly will this happen? That depends on both your latitude and longitude.

When it happens, turn around and look low in the south-southeast (well to the lower left of the Moon tonight). There you'll find 1st-magnitude Fomalhaut at the same height too — if you're at latitude 43° north. Seen from south of that latitude, Fomalhaut will be higher than Capella and Arcturus. Seen from north of there, it will be lower.

Sunday, October 1

• The starry W of Cassiopeia stands high in the northeast after dark. The right-hand side of the W (the brightest side) is tilted up.

Look along the second segment of the W counting down from the top. It's not quite horizontal. Notice the dim naked-eye star partway along that segment. That's Eta Cassiopeiae, magnitude 3.4, a Sun-like star just 19 light-years away with an orange-dwarf companion. It's a lovely binary pair in a telescope, with an easy separation of 20 arcseconds.

Left of Eta Cas along the segment is a fainter, much wider pair: Upsilon^1 and Upsilon^2 Cassiopeiae, separation 0.3° (1,200 arcseconds). This pair consists of two orange giants, and they're unrelated to each other; they're 200 and 400 light-years from us.

Monday, October 2

• After dark, look low above the northeast horizon — far below Cassiopeia — for bright Capella on the rise. How high you'll find it depends on your latitude. The farther north you are, the higher it will be.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Sep 29, 7:10 PM	4 min	54°	40° above W	10° above NE
Fri Sep 29, 8:47 PM	2 min	14°	11° above NW	14° above N
Sat Sep 30, 7:55 PM	3 min	18°	16° above NW	10° above NNE
Sun Oct 1, 7:03 PM	3 min	26°	25° above NW	10° above NNE
Sun Oct 1, 8:40 PM	1 min	11°	10° above NNW	11° above N
Mon Oct 2, 7:47 PM	3 min	13°	10° above NW	11° above NNE

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

Friday, September 29

5 p.m., 8 p.m., Replay of SpaceCast Weekly (all channels)

Saturday, September 30

8 a.m., 1 p.m., 4 p.m., 9 p.m., Replay of SpaceCast Weekly (all channels)

10 a.m., The Smithsonian's National Air & Space Museum's "What's New in Aerospace?" What's Next in the Search for Habitable Planets (NTV-1 (Public))

11 a.m., 3 p.m., 7 p.m., 11 p.m., Replay of the ISS Expedition 53 In-Flight Educational Event with the STEM in 30 Program at the National Air and Space Museum and ISS Commander Randy Bresnik of NASA (all channels)

2 p.m., 8 p.m., Von Karman Lecture Series - Volcanologists Paradise (Replay) (NTV-1 (Public))

5 p.m., Replay of The Smithsonian's National Air & Space Museum's "What's New in Aerospace?" What's Next in the Search for Habitable Planets (all channels)

Sunday, October 1

8 a.m., 6 p.m., Replay of SpaceCast Weekly (all channels)

9 a.m., 4 p.m., Replay of The Smithsonian's National Air & Space Museum's "What's New in Aerospace?" What's Next in the Search for Habitable Planets (NTV-1 (Public))

11 a.m., 3 p.m., 7 p.m., Replay of the ISS Expedition 53 In-Flight Educational Event with the STEM in 30 Program at the National Air and Space Museum and ISS Commander Randy Bresnik of NASA (all channels)

2 p.m., 8 p.m., Von Karman Lecture Series - Volcanologists Paradise (Replay) (NTV-1 (Public))

Watch NASA TV on the Net by going to the NASA website.

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Space Calendar

- Sep 29 - Intelsat 37E/ BSAT 4A Ariane 5 Launch
- Sep 29 - Comet 73P-BS/Schwassmann-Wachmann At Opposition (0.717 AU)
- Sep 29 - Comet 73P-H/Schwassmann-Wachmann Closest Approach To Earth (1.589 AU)
- Sep 29 - Comet P/2010 D1 (WISE) At Opposition (1.737 AU)
- Sep 29 - Comet P/2006 D1 (Hill) At Opposition (3.246 AU)
- Sep 29 - Comet 299P/Catalina-PANSTARRS At Opposition (3.950 AU)
- Sep 29 - Comet P/2015 M2 (PANSTARRS) At Opposition (5.311 AU)
- Sep 29 - Apollo Asteroid 1989 VB Near-Earth Flyby (0.020 AU)
- Sep 29 - NEW [Sep 26] Amor Asteroid 2017 SQ12 Near-Earth Flyby (0.044 AU)
- Sep 29 - Asteroid 71885 Denning Closest Approach To Earth (1.272 AU)
- Sep 29 - Asteroid 4716 Urey Closest Approach To Earth (2.339 AU)
- Sep 29 - Plutino 469372 (2001 QF298) At Opposition (42.446 AU)
- Sep 29 - 40th Anniversary (1977), Salyut 6 Space Station Launch
- Sep 30 - Astronomy Day
- Sep 30 - SES-14/GOLD Falcon 9 Launch
- Sep 30 - Comet 263P/Gibbs Perihelion (1.263 AU)
- Sep 30 - Comet 73P-B/Schwassmann-Wachmann Closest Approach To Earth (1.596 AU)
- Sep 30 - Comet 73P-K/Schwassmann-Wachmann Closest Approach To Earth (1.598 AU)
- Sep 30 - Comet 73P-G/Schwassmann-Wachmann Closest Approach To Earth (1.615 AU)
- Sep 30 - Comet 73P/Schwassmann-Wachmann Closest Approach To Earth (1.619 AU)
- Sep 30 - Comet 73P-C/Schwassmann-Wachmann Closest Approach To Earth (1.620 AU)
- Sep 30 - Comet 73P-BT/Schwassmann-Wachmann Closest Approach To Earth (1.620 AU)
- Sep 30 - Comet 9P/Tempel Closest Approach To Earth (2.560 AU)
- Sep 30 - Comet P/2008 CL94 (Lemmon) At Opposition (5.296 AU)
- Sep 30 - NEW [Sep 29] Apollo Asteroid 2017 SH16 Near-Earth Flyby (0.023 AU)
- Sep 30 - Apollo Asteroid 2017 RP15 Near-Earth Flyby (0.038 AU)
- Sep 30 - NEW [Sep 26] Apollo Asteroid 2017 SN12 Near-Earth Flyby (0.051 AU)
- Sep 30 - Aten Asteroid 2015 SO2 Near-Earth Flyby (0.066 AU)
- Sep 30 - Asteroid 6735 Madhatter Closest Approach To Earth (1.083 AU)
- Sep 30 - Asteroid 6296 Cleveland Closest Approach To Earth (1.168 AU)
- Oct 01 - Comet 73P-AI/Schwassmann-Wachmann At Opposition (0.775 AU)
- Oct 01 - Comet P/2010 P4 (WISE) Closest Approach To Earth (0.929 AU)
- Oct 01 - Comet 73P-AV/Schwassmann-Wachmann Closest Approach To Earth (1.638 AU)
- Oct 01 - Dwarf Planet Ceres Occults TYC 1928-00279-1 (11.0 Magnitude Star)
- Oct 01 - NEW [Sep 28] Amor Asteroid 2017 SK14 Near-Earth Flyby (0.049 AU)
- Oct 01 - Aten Asteroid 2004 QA22 Near-Earth Flyby (0.065 AU)
- Oct 01 - Apollo Asteroid 2015 XE Near-Earth Flyby (0.083 AU)
- Oct 01 - Apollo Asteroid 2329 Orthos Closest Approach To Earth (0.158 AU)
- Oct 01 - Asteroid 327695 Yokoono Closest Approach To Earth (1.578 AU)
- Oct 01 - Kuiper Belt Object 2015 RR245 At Opposition (62.481 AU)
- Oct 01 - 170th Anniversary (1847), Maria Mitchell Discovers Comet C/1847 T1
- Oct 02 - Comet P/2013 YG46 (Spacewatch) Closest Approach To Earth (1.679 AU)
- Oct 02 - Comet P/2010 D1 (WISE) Closest Approach To Earth (1.736 AU)
- Oct 02 - Comet 60P/Tsuchinshan Closest Approach To Earth (2.735 AU)
- Oct 02 - Comet P/2008 CL94 (Lemmon) Closest Approach To Earth (5.296 AU)
- Oct 02 - Asteroid 6487 Tonyspear Closest Approach To Earth (1.287 AU)
- Oct 02 - Asteroid 19620 Auckland Closest Approach To Earth (1.691 AU)
- Oct 02 - Asteroid 14965 Bonk Closest Approach To Earth (1.792 AU)
- Oct 02 - Frank Malina's 105th Birthday (1912)

Source: JPL Space Calendar

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Food for Thought

Dawn Mission Celebrates 10 Years in Space

Ten years ago, NASA's Dawn spacecraft set sail for the two most massive bodies in the asteroid belt between Mars and Jupiter: giant asteroid Vesta and dwarf planet Ceres. The mission was designed to deliver new knowledge about these small but intricate worlds, which hold clues to the formation of planets in our solar system.

"Our interplanetary spaceship has exceeded all expectations in the last decade, delivering amazing insights about these two fascinating bodies," said Chris Russell, principal investigator of the Dawn mission, based at the University of California, Los Angeles.

Since its launch on Sept. 27, 2007, Dawn has achieved numerous technical and scientific feats while traveling 4 billion miles (6 billion kilometers). It is the only spacecraft to orbit two extraterrestrial solar system targets. It is also the only spacecraft to orbit a dwarf planet, a milestone it achieved when in entered orbit around Ceres on March 6, 2015. The spacecraft's ion propulsion system enabled Dawn to study each of these worlds from a variety of vantage points and altitudes, creating an impressive scrapbook of 88,000 photos. Additionally, Dawn's suite of instruments enabled it to take a variety of other measurements of Vesta and Ceres, revealing the contrasting compositions and internal structures of these two bodies.

Vesta Highlights

Scientists learned a great deal about Vesta's geological features and composition during Dawn's 14 months of exploration there. A notable discovery was that Rheasilvia, a giant basin in Vesta's southern hemisphere, was even deeper and wider than scientists expected based on telescopic observations from Earth. It spans more than 310 miles (500 kilometers) and pierces about 12 miles (19 kilometers) into Vesta. The center of the crater also hosts a mountain twice the height of Mt. Everest -- the tallest feature seen in Dawn's 1,298 orbits of Vesta.

The massive punch into Vesta that carved out this crater happened about 1 billion years ago and caused huge amounts of material to rain down on the surface. The net result is that the surface of the southern hemisphere of Vesta is younger than the northern hemisphere, which retains a hefty record of craters. The Rheasilvia impact also created dozens of gorges circling Vesta's equator. Canyons there, some of which formed from an earlier impact, measure up to 290 miles (465 kilometers) in length.

Ceres Highlights

One of Dawn's biggest revelations at Ceres is the extremely bright, salty material in Occator Crater that gleams amid an otherwise dark area. What appeared to be a single white blob at a distance turned out to be a smattering of many bright areas called faculae. The central bright area, Cerealia Facula, has a dome at its center with radial fractures across it that appears reddish in enhanced color images. This "bright spot" suggests Ceres was geologically active in the very recent past, when briny water rose to the surface and deposited salts. Just to the east are the Vinalia Faculae, a constellation of less-bright spots distributed along fractures that also intrigue scientists. Ceres hosts more than 300 small bright areas, with some thought to host ice at northern latitudes.

Another huge surprise at Ceres was Ahuna Mons, which scientists believe formed as a cryovolcano, a volcano that erupted with salty water in the past. This "lonely mountain," 3 miles (5 kilometers) high on its steepest side, is unlike anything else on Ceres and remains a thriving research topic. Though both Ahuna Mons and Occator appear dormant, they suggest that liquid water flowed once beneath the surface of Ceres, and may even still be there today, if it is enriched in salts that would lower its freezing point.

Dawn Science Continues

"The science team is still actively exploring the troves of data that Dawn has delivered so far, comparing these two fossils of the early solar system," said Carol Raymond, Dawn deputy principal investigator, based at NASA's Jet Propulsion Laboratory, Pasadena, California.

Since March 2015, Dawn has orbited Ceres 1,595 times. It remains healthy, currently in a 30-day elliptical orbit collecting data on cosmic rays in the vicinity of Ceres.

"This continues to be a mission for everyone who yearns for new knowledge, everyone who is curious about the cosmos, and everyone who is exhilarated by bold adventures into the unknown," said Marc Rayman, mission director and chief engineer, based at JPL.

Dawn's mission is managed by the Jet Propulsion Laboratory for NASA's Science Mission Directorate in Washington. Dawn is a project of the directorate's Discovery Program, managed by NASA's Marshall Space Flight Center in Huntsville, Alabama. UCLA is responsible for overall Dawn mission science. Orbital ATK, Inc., in Dulles, Virginia, designed and built the spacecraft. The German Aerospace Center, the Max Planck Institute for Solar System Research, the Italian Space Agency and the Italian National Astrophysical Institute are international partners on the mission team. For a complete list of acknowledgments, see http://dawn.jpl.nasa.gov/mission.

For more information about the Dawn mission, visit https://dawn.jpl.nasa.gov

Source: NASA Return to Contents

Space Image of the Week

Cassini's Last Ring Portrait at Saturn

Explanation: How should Cassini say farewell to Saturn? Three days before plunging into Saturn's sunny side, the robotic Cassini spacecraft swooped far behind Saturn's night side with cameras blazing. Thirty-six of these images have been merged -- by an alert and adept citizen scientist -- into a last full-ring portrait of Cassini's home planet for the past 13 years. The Sun is just above the frame, causing Saturn to cast a dark shadow onto its enormous rings. This shadow positioncannot be imaged from Earth and will not be visible again until another Earth-launched spaceship visits the ringed giant. Data and images from Cassini's mission-ending dive into Saturn's atmosphere on September 15 continue to be analyzed.

Image Credit: NASA**,** JPL-Caltech**,** Space Science Institute**,** Mindaugas Macijauskas

Source: APOD

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