Space News Update

— June 15, 2018 —

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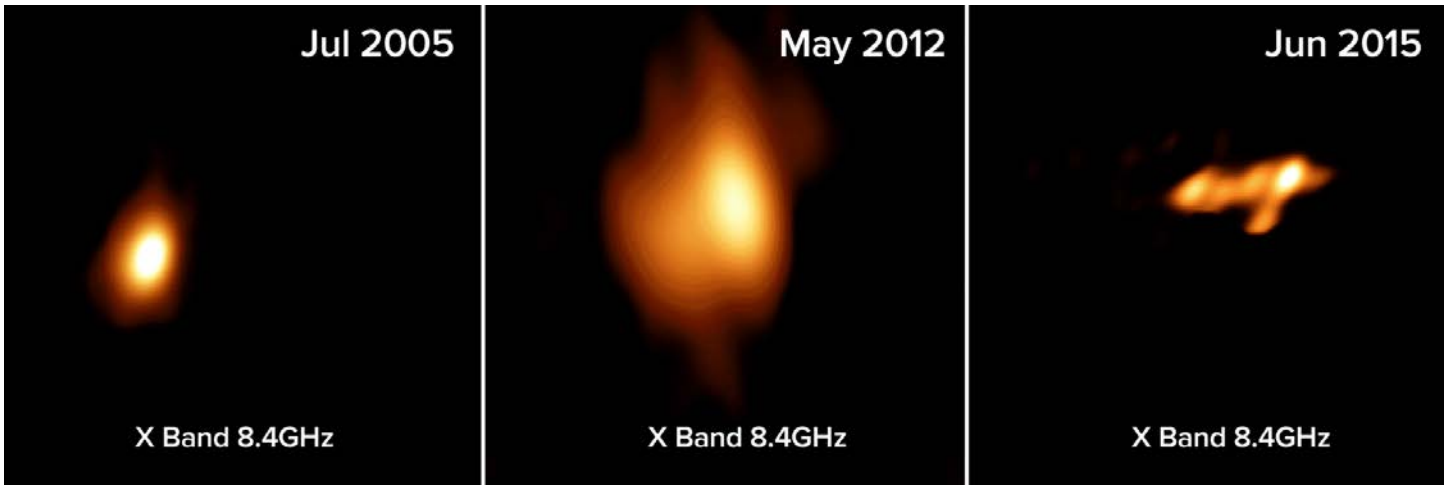
1. Astronomers see distant eruption as black hole destroys star



For the first time, astronomers have directly imaged the formation and expansion of a fast-moving jet of material ejected when the powerful gravity of a supermassive black hole ripped apart a star that wandered too close to the cosmic monster.

The scientists tracked the event with radio and infrared telescopes, including the National Science Foundation's Very Long Baseline Array (VLBA), in a pair of colliding galaxies called Arp 299, nearly 150 million light-years from Earth. At the core of one of the galaxies, a black hole 20 million times more massive than the Sun shredded a star more than twice the Sun's mass, setting off a chain of events that revealed important details of the violent encounter.

Only a small number of such stellar deaths, called tidal disruption events, or TDEs, have been detected, although scientists have hypothesized that they may be a more common occurrence. Theorists suggested that material pulled from the doomed star forms a rotating disk around the black hole, emitting intense X-rays and visible light, and also launches jets of material outward from the poles of the disk at nearly the speed of light.

"Never before have we been able to directly observe the formation and evolution of a jet from one of these events," said Miguel Perez-Torres, of the Astrophysical Institute of Andalusia in Granada, Spain.

The first indication came on January 30, 2005, when astronomers using the William Herschel Telescope in the Canary Islands discovered a bright burst of infrared emission coming from the nucleus of one of the colliding galaxies in Arp 299. On July 17, 2005, the VLBA revealed a new, distinct source of radio emission from the same location.

"As time passed, the new object stayed bright at infrared and radio wavelengths, but not in visible light and X-rays," said Seppo Mattila, of the University of Turku in Finland. "The most likely explanation is that thick interstellar gas and dust near the galaxy's center absorbed the X-rays and visible light, then re-radiated it as infrared," he added. The researchers used the Nordic Optical Telescope on the Canary Islands and NASA's Spitzer space telescope to follow the object's infrared emission.

Continued observations with the VLBA, the European VLBI Network (EVN), and other radio telescopes, carried out over nearly a decade, showed the source of radio emission expanding in one direction, just as expected for a jet. The measured expansion indicated that the material in the jet moved at an average of one-fourth the speed of light. Fortunately, the radio waves are not absorbed in the core of the galaxy, but find their way through it to reach the Earth.

These observations used multiple radio-telescope antennas, separated by thousands of miles, to gain the resolving power, or ability to see fine detail, required to detect the expansion of an object so distant. The patient, years-long data collection rewarded the scientists with the evidence of a jet.

Most galaxies have supermassive black holes, containing millions to billions of times the mass of the Sun, at their cores. In a black hole, the mass is so concentrated that its gravitational pull is so strong that not even light can escape. When those supermassive black holes are actively drawing in material from their surroundings, that material forms a rotating disk around the black hole, and superfast jets of particles are launched outward. This is the phenomenon seen in radio galaxies and quasars.

"Much of the time, however, supermassive black holes are not actively devouring anything, so they are in a quiet state," Perez-Torres explained. "Tidal disruption events can provide us with a unique opportunity to advance our understanding of the formation and evolution of jets in the vicinities of these powerful objects," he added.

"Because of the dust that absorbed any visible light, this particular tidal disruption event may be just the tip of the iceberg of what until now has been a hidden population," Mattila said. "By looking for these events with infrared and radio telescopes, we may be able to discover many more, and learn from them," he said.

Such events may have been more common in the distant Universe, so studying them may help scientists understand the environment in which galaxies developed billions of years ago.

The discovery, the scientists said, came as a surprise. The initial infrared burst was discovered as part of a project that sought to detect supernova explosions in such colliding pairs of galaxies. Arp 299 has seen numerous stellar explosions, and has been dubbed a "supernova factory." This new object originally was considered to be a supernova explosion. Only in 2011, six years after discovery, the radio-emitting portion began to show an elongation. Subsequent monitoring showed the expansion growing, confirming that what the scientists are seeing is a jet, not a supernova.

Mattila and Perez-Torres led a team of 36 scientists from 26 institutions around the world in the observations of Arp 299. They published their findings in the 14 June online issue of the journal *Science*.

Source: Phys.org Return to Contents

2. Space Station Astronauts Take Spacewalk to Install Cameras

Two astronauts floated outside the International Space Station Thursday and installed two new cameras on the front of the lab complex that will provide views of commercial crew ships during final approach and docking. The spacewalkers also replaced a faulty high-definition camera and closed a door that was jammed open on an external instrument.

Floating in the Quest airlock, Expedition 56 commander Drew Feustel and Ricky Arnold switched their spacesuits to battery power at 8:06 a.m. EDT (GMT-4), kicking off what turned out to be a six-hour 49-minute excursion.

It was the fifth spacewalk overall for Arnold and the ninth for Feustel, who now ranks third in the world, logging a total of 61 hours and 48 minutes across nine EVAs. The all-time record is held by Anatoly Solovyev, who logged 78 hours and 21 minutes of spacewalk time during 16 excursions.

Records aside, the major goal of U.S. EVA-51 was installation of two new cameras on the front of the forward Harmony module that will provide views of Boeing CST-100 Starliner and SpaceX crewed Dragon spacecraft during final approach to a new docking mechanism mounted on the port where space shuttles once attached.

The new crew ferry ships are intended to end NASA's sole reliance on Russian Soyuz spacecraft to carry U.S., European, Japanese and Canadian astronauts to the outpost, restoring American space transportation capability that was lost when the shuttle program ended in 2011.

Development of the new crew ships is behind schedule and it's not yet clear when the first unpiloted test flights will be possible, but NASA hopes to begin operational crew ferry missions as soon as possible next year.

The camera work required Arnold and Feustel to connect power and ethernet cables on a distribution panel on the Destiny lab module. Connecting the wires beneath a micrometeoroid panel, securing them and re-stowing the panel, proved time consuming, but the crew had no major problems.

The astronauts then returned to the airlock, collected the new cameras and their mounts and moved up to the front of the station where they were installed and connected to already-routed cables. Live views from the cameras showed they were working normally, sending down sharp views of the Earth 250 miles below.

At that point, Arnold and Feustel split up. Arnold climbed on the station's robot arm and replaced a high-definition camera and light assembly on the right side of the station that were not working properly. Feustel, meanwhile, ventured to the far left side of the station to work on a payload mounted outside the Japanese Kibo laboratory module.

The Cloud-Aerosol Transport System, or CATS, instrument was designed to study the atmosphere using a laser firing through a large aperture door. The instrument failed earlier, leaving the door open, and Feustel manually closed it and wire-tied it in place so the instrument will fit aboard a SpaceX cargo ship later for disposal.

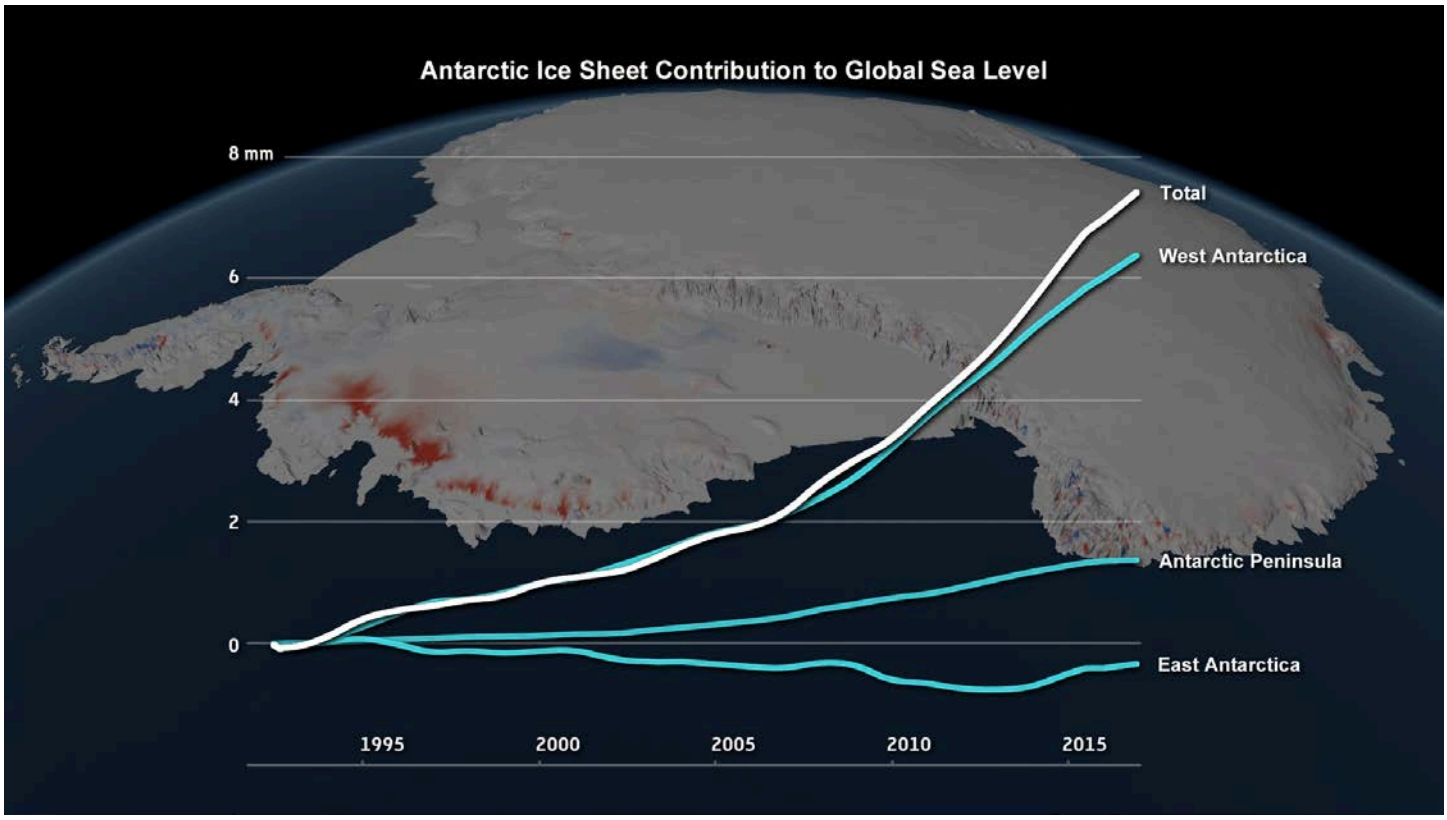
Before calling it a day, the astronauts carried out two lower-priority "get-ahead" tasks and then returned to the Quest airlock, beginning repressurization procedures at 2:55 p.m. to officially close out the six-hour 49-minute spacewalk.

"Hey, we're home," one of the spacewalkers called from the airlock.

More than 120 astronauts and cosmonauts have now logged 1,319 hours and 29 minutes of spacewalk time during 211 EVAS building and maintaining the International Space Station.

Source: CBS News Return to Contents

3. Ramp-Up in Antarctic Ice Loss Speeds Sea Level Rise



Ice losses from Antarctica have tripled since 2012, increasing global sea levels by 0.12 inch (3 millimeters) in that timeframe alone, according to a major new international climate assessment funded by NASA and the European Space Agency (ESA).

According to the study, ice losses from Antarctica are causing sea levels to rise faster today than at any time in the past 25 years. Results of the Ice Sheet Mass Balance Inter-comparison Exercise (IMBIE) were published Wednesday in the journal Nature.

"This is the most robust study of the ice mass balance of Antarctica to date," said assessment team co-lead Erik Ivins at NASA's Jet Propulsion Laboratory in Pasadena, California. "It covers a longer period than our 2012 IMBIE study, has a larger pool of participants and incorporates refinements in our observing capability and an improved ability to assess uncertainties."

This latest IMBIE is the most complete assessment of Antarctic ice mass changes to date, combining 24 satellite surveys of Antarctica and involving 80 scientists from 42 international organizations.

The team looked at the mass balance of the Antarctic ice sheet from 1992 to 2017 and found ice losses from Antarctica raised global sea levels by 0.3 inches (7.6 millimeters), with a sharp uptick in ice loss in recent years. They attribute the threefold increase in ice loss from the continent since 2012 to a combination of increased rates of ice melt in West Antarctica and the Antarctic Peninsula, and reduced growth of the East Antarctic ice sheet.

Prior to 2012, ice was lost at a steady rate of about 83.8 billion tons (76 billion metric tons) per year, contributing about 0.008 inches (0.2 millimeters) a year to sea level rise. Since 2012, the amount of ice loss per year has tripled to 241.4 billion tons (219 billion metric tonnes) -- equivalent to about 0.02 inches per year (0.6 millimeters) of sea level rise.

West Antarctica experienced the greatest recent change, with ice loss rising from 58.4 billion tons (53 billion metric tons) per year in the 1990s, to 175.3 billion tons (159 billion metric tons) a year since 2012. Most of this loss came from the huge Pine Island and Thwaites Glaciers, which are retreating rapidly due to ocean-induced melting.

At the northern tip of the continent, ice-shelf collapse at the Antarctic Peninsula has driven an increase of 27.6 billion tons (25 billion metric tons) in ice loss per year since the early 2000s. Meanwhile, the team found the East Antarctic ice sheet has remained relatively balanced during the past 25 years, gaining an average of 5.5 billion tons (5 billion metric tons) of ice per year.

Antarctica's potential contribution to global sea level rise from its land-held ice is almost 7.5 times greater than all other sources of land-held ice in the world combined. The continent stores enough frozen water to raise global sea levels by 190 feet (58 meters), if it were to melt entirely. Knowing how much ice it's losing is key to understanding the impacts of climate change now and its pace in the future.

"The datasets from IMBIE are extremely valuable for the ice sheet modeling community," said study co-author Sophie Nowicki of NASA's Goddard Space Flight Center in Greenbelt, Maryland. "They allow us to test whether our models can reproduce present-day change and give us more confidence in our projections of future ice loss."

The satellite missions providing data for this study are NASA's Ice, Cloud and land Elevation Satellite (ICESat); the joint NASA/German Aerospace Center Gravity Recovery and Climate Experiment (GRACE); ESA's first and second European Remote Sensing satellites, Envisat and CryoSat-2; the European Union's Sentinel-1 and Sentinel-2 missions; the Japan Aerospace Exploration Agency's Advanced Land Observatory System; the Canadian Space Agency's RADARSAT-1 and RADARSAT-2 satellites; the Italian Space Agency's COSMO-SkyMed satellites; and the German Aerospace Center's TerraSAR-X satellite.

Tom Wagner, cryosphere program manager at NASA Headquarters in Washington, hopes to welcome a new era of Antarctic science with the May 2018 launch of the Gravity Recovery and Climate Experiment Follow-on (GRACE-FO) mission and the upcoming launch of NASA's Ice, Cloud and land Elevation Satellite-2 (ICESat-2).

"Data from these missions will help scientists connect the environmental drivers of change with the mechanisms of ice loss to improve our projections of sea level rise in the coming decades," Wagner said.

Source: JPL Return to Contents

The Night Sky

Friday, June 15

• As twilight fades after sunset, look very low in the west-northwest for the thin crescent Moon under Venus, as shown here.

• It's almost summer. But as twilight fades, look very low in the north-northwest for wintry Capella very out of season. The farther north you are, the higher it will appear. You may need binoculars. If you're as far north as Portland Oregon and Portland Maine, Capella is actually circumpolar.

Saturday, June 16

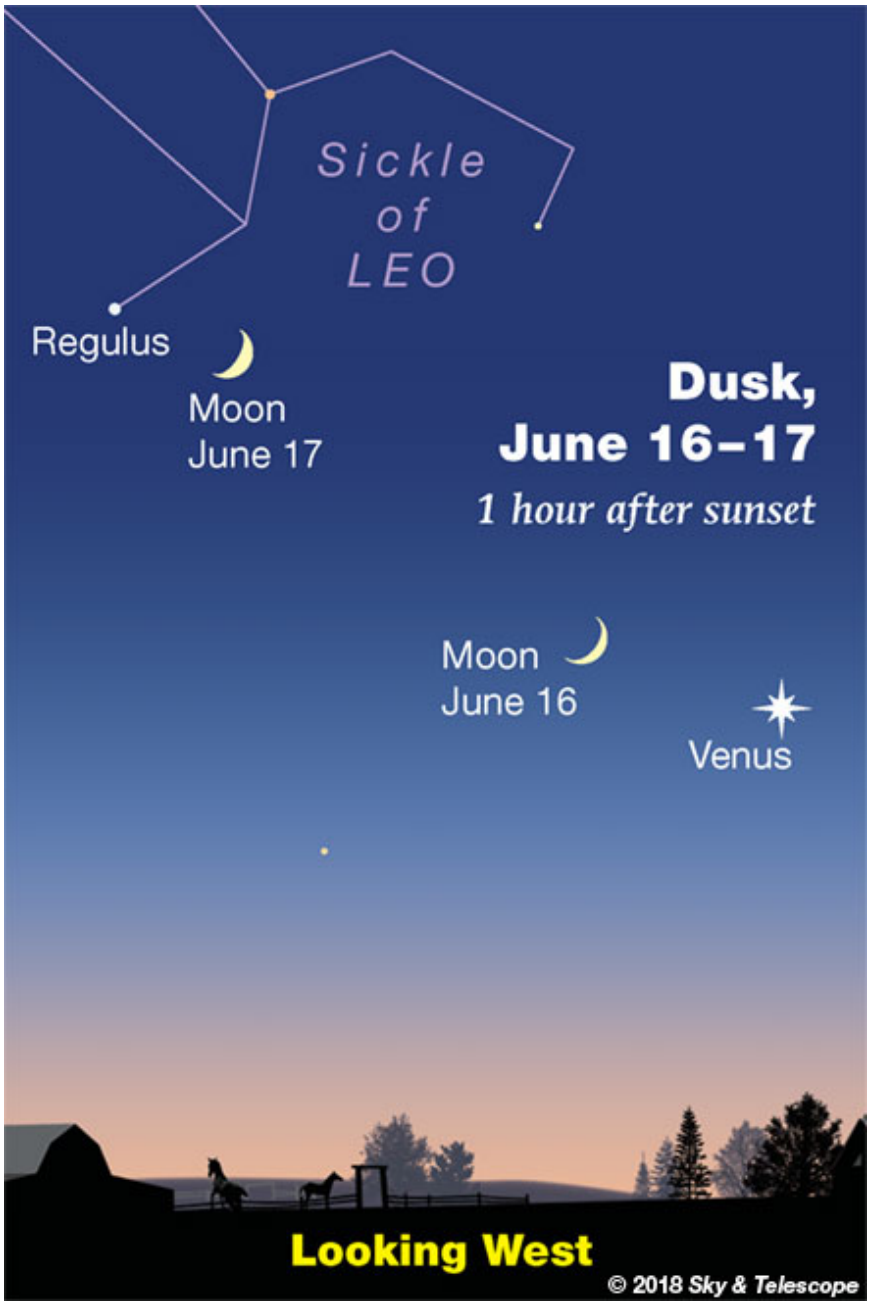
• Look west as twilight fades for Venus and the thin waxing crescent Moon, as shown below. They're about 8° apart at the times of twilight for North America. Higher to their upper left, look for much fainter Regulus coming out as twilight fades further.

Sunday, June 17

• The crescent Moon, far upper left of Venus, shines near Regulus tonight. Almost as bright as Regulus is orange Gamma Leonis (Algieba), higher above the Moon as shown here.

Monday, June 18

• Now Regulus shines to the Moon's lower right. Look for Denebola, Leo's tail tip, higher to the Moon's upper left.



Tuesday, June 19

• With summer officially just two days away, the Summer Triangle stands high and proud in the east after dark. Its top star is bright Vega. Deneb is the brightest star to Vega's lower left (by 2 or 3 fists at arm's length). Look for Altair a greater distance to Vega's lower right.

If you have a dark sky, you'll see that the Milky Way passes under Vega through the Summer Triangle.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

There are no sightings in Denver for the period of **Monday June 11, 2018 through Wednesday June 27, 2018**

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

NASA-TV Highlights

(all times Eastern Daylight Time)

June 15, Friday
1:30 p.m. – Space Station Crew Presentation with astronauts Joe Acaba and Mark Vande Hei (All Channels)

June 18, Monday
2 p.m. – Space Station Crew News Conference with Nick Hague and Alexey Ovchinin (All Channels)

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

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Space Calendar

- Jun 14 - Comet 112P/Urata-Niijima At Opposition (3.604 AU)
- Jun 14 - Comet 204P/LINEAR-NEAT At Opposition (4.051 AU)
- Jun 14 - Comet C/2017 X1 (PANSTARRS) Perihelion (4.663 AU)
- Jun 14 - Asteroid 2032 Ethel Occults HIP 93993 (6.3 Magnitude Star)
- Jun 14 - NEW [Jun 08] Apollo Asteroid 2018 LD1 Near-Earth Flyby (0.004 AU)
- Jun 14 - Apollo Asteroid 3361 Orpheus Closest Approach To Earth (0.448 AU)
- Jun 14 - Asteroid 3720 Hokkaido Closest Approach To Earth (1.092 AU)
- Jun 14 - Asteroid 4987 Flamsteed Closest Approach To Earth (1.147 AU)
- Jun 14 - Asteroid 8277 Machu-Picchu Closest Approach To Earth (1.418 AU)
- Jun 14 - Asteroid 7220 Philnicholson Closest Approach To Earth (1.536 AU)
- Jun 14 - Asteroid 4808 Ballaero Closest Approach To Earth (2.094 AU)
- Jun 14 - 50th Anniversary (1968), 1st Asteroid Observed by Radar (1566 Icarus)
- Jun 15 - NEW [Jun 13] Apollo Asteroid 2018 LV3 Near-Earth Flyby (0.002 AU)
- Jun 15 - Apollo Asteroid 2018 LK Near-Earth Flyby (0.020 AU)
- Jun 15 - Aten Asteroid 2004 LO2 Near-Earth Flyby (0.064 AU)
- Jun 15 - Asteroid 6600 Qwerty Closest Approach To Earth (1.518 AU)
- Jun 15 - Hubertus Strughold's 120th Birthday (1898)
- Jun 16 - Aten Asteroid 469737 (2005 NW44) Near-Earth Flyby (0.055 AU)
- Jun 16 - NEW [Jun 08] Apollo Asteroid 2018 LF1 Near-Earth Flyby (0.040 AU)
- Jun 16 - Apollo Asteroid 2018 BC Near-Earth Flyby (0.071 AU)
- Jun 16 - Aten Asteroid 2014 GQ17 Near-Earth Flyby (0.086 AU)
- Jun 16 - Asteroid 46686 Anitasohus Closest Approach To Earth (1.213 AU)
- Jun 16 - Asteroid 8250 Cornell Closest Approach To Earth (1.798 AU)
- Jun 16 - Apollo Asteroid 162173 Ryugu Closest Approach To Earth (1.897 AU)
- Jun 16 - Amor Asteroid 3199 Nefertiti Closest Approach To Earth (1.912 AU)
- Jun 16 - Asteroid 5231 Verne Closest Approach To Earth (1.930 AU)
- Jun 16 - Asteroid 1213 Algeria Closest Approach To Earth (2.288 AU)
- Jun 16 - 55th Anniversary (1963), 1st Woman In Space (Valentina Tereshkova)
- Jun 16 - 80th Anniversary (1938), Pantar Meteorite Fall (Hit Buildings in Philippine Islands)
- Jun 16 - Alexander Friedmann's 130th Birthday (1888)
- Jun 17 - Telstar 19V Falcon 9 Launch
- Jun 17 - UPDATED [Jun 07] GLONASS-M 756 Soyuz-2.1b/Fregat-M Launch
- Jun 17 - NEW [Jun 13] GLONASS-M 759 Soyuz-2.1b/Fregat-M Launch
- Jun 17 - NEW [Jun 10] Comet C/2018 L2 (ATLAS) Closest Approach To Earth (1.951 AU)
- Jun 17 - Comet 261P/Larson Closest Approach To Earth (2.233 AU)
- Jun 17 - Comet C/2017 M4 (ATLAS) At Opposition (3.351 AU)
- Jun 17 - NEW [Jun 13] Amor Asteroid 2018 LD4 Near-Earth Flyby (0.038 AU)
- Jun 17 - Asteroid 2000 Herschel Closest Approach To Earth (2.055 AU)
- Jun 17 - Asteroid 2118 Flagstaff Closest Approach To Earth (2.085 AU)
- Jun 17 - Asteroid 13010 Germantitov Closest Approach To Earth (2.466 AU)
- Jun 17 - Asteroid 10063 Erinleeryan Closest Approach To Earth (2.961 AU)
- Jun 17 - James Elliot's 75th Birthday (1943)
- Jun 18 - Comet 5D/Brorsen At Opposition (2.385 AU)
- Jun 18 - Comet P/2017 P1 (PANSTARRS) Perihelion (5.437 AU)
- Jun 18 - NEW [Jun 13] Amor Asteroid 2018 LT3 Near-Earth Flyby (0.061 AU)
- Jun 18 - Asteroid 896 Sphinx Closest Approach To Earth (0.903 AU)
- Jun 18 - Asteroid 4372 Quincy Closest Approach To Earth (2.109 AU)
- Jun 18 - Asteroid 2421 Nininger Closest Approach To Earth (2.223 AU)
- Jun 18 - Plutino 28978 Ixion At Opposition (38.457 AU)

- Jun 18 - 35th Anniversary (1983), 1st US Woman In Space (Sally Ride)
- Jun 18-22 - Mars Workshop on Amazonian and Present Day Climate, Lakewood, Colorado
- Jun 19 - Comet P/2002 EJ57 (LINEAR) Perihelion (2.627 AU)
- Jun 19 - Centaur Object 10199 Chariklo Occults 2UCAC 20035476 (14.8 Magnitude Star)
- Jun 19 - Apollo Asteroid 2018 KC3 Near-Earth Flyby (0.037 AU)
- Jun 19 - Asteroid 4 Vesta Closest Approach To Earth (1.142 AU)
- Jun 19 - Asteroid 14413 Geiger Closest Approach To Earth (1.499 AU)
- Jun 19 - Asteroid 6442 Salzburg Closest Approach To Earth (1.565 AU)
- Jun 19 - Asteroid 5441 Andymurray Closest Approach To Earth (1.804 AU)
- Jun 19 - Asteroid 1815 Beethoven Closest Approach To Earth (2.686 AU)
- Jun 19 - Conference: The Space Age - A Global Revolution, Liverpool, United Kingdom
- Jun 19 - 15th Anniversary (2003), Nozomi, Earth Flyby
- Jun 19 - Viktor Patsayev's 85th Birthday (1933)

Source: JPL Space Calendar

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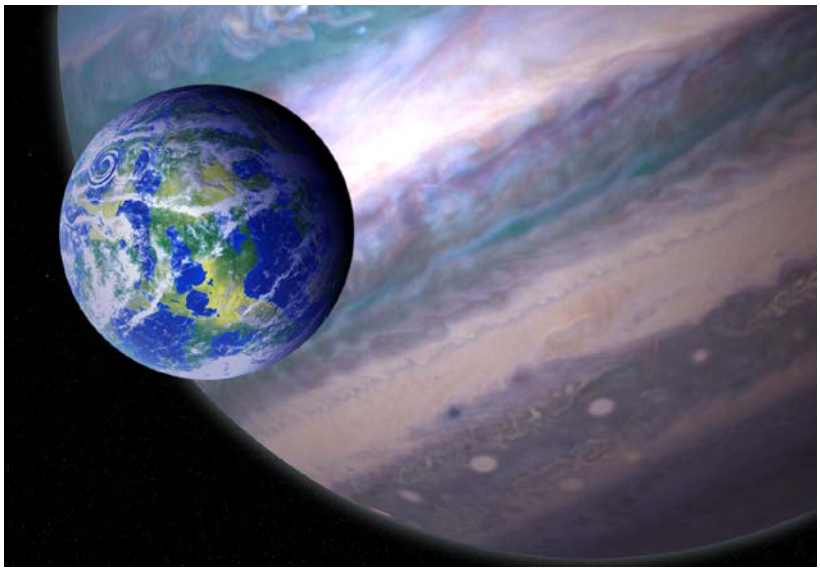
Food for Thought

Distant moons may harbor life



We've all heard about the search for life on other planets, but what about looking on other moons?

In a paper published Wednesday (June 13) in *The Astrophysical Journal*, researchers at the University of California, Riverside and the University of Southern Queensland have identified more than 100 giant planets that potentially host moons capable of supporting life. Their work will guide the design of future telescopes that can detect these potential moons and look for tell-tale signs of life, called biosignatures, in their atmospheres.

Since the 2009 launch of NASA's Kepler telescope, scientists have identified thousands of planets outside our solar system, which are called exoplanets. A primary goal of the Kepler mission is to identify planets that are in the habitable zones of their stars, meaning it's neither too hot nor too cold for liquid water -- and potentially life -- to exist.

Terrestrial (rocky) planets are prime targets in the quest to find life because some of them might be geologically and atmospherically similar to Earth. Another place to look is the many gas giants identified during the Kepler mission. While not a candidate for life themselves, Jupiter-like planets in the habitable zone may harbor rocky moons, called exomoons, that could sustain life.

"There are currently 175 known moons orbiting the eight planets in our solar system. While most of these moons orbit Saturn and Jupiter, which are outside the Sun's habitable zone, that may not be the case in other solar systems," said Stephen Kane, an associate professor of planetary astrophysics and a member of the UCR's Alternative Earths Astrobiology Center. "Including rocky exomoons in our search for life in space will greatly expand the places we can look."

The researchers identified 121 giant planets that have orbits within the habitable zones of their stars. At more than three times the radii of the Earth, these gaseous planets are less common than terrestrial planets, but each is expected to host several large moons.

Scientists have speculated that exomoons might provide a favorable environment for life, perhaps even better than Earth. That's because they receive energy not only from their star, but also from radiation reflected from their planet. Until now, no exomoons have been confirmed.

"Now that we have created a database of the known giant planets in the habitable zone of their star, observations of the best candidates for hosting potential exomoons will be made to help refine the expected exomoon properties. Our follow-up studies will help inform future telescope design so that we can detect these moons, study their properties, and look for signs of life," said Michelle Hill, an undergraduate student at the University of Southern Queensland who is working with Kane and will join UCR's graduate program in the fall.

Source: EurekAlert Return to Contents

Space Image of the Week

416 Wildfire Rages in Colorado

On June 11, 2018, the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite acquired this natural-color image of smoke from fires burning in southwestern Colorado.

The 416 Fire, located 21 kilometers (13 miles) north of Durango, began burning on June 1 and grew to more than 23,000 acres (93 square kilometers, or 36 square miles) by June 12. According to news reports, residents from more than 2,000 homes in the area were ordered to evacuate.

The Colorado blaze led to the closure of San Juan National Forest. Meanwhile, dry and warm conditions in the U.S. Southwest led to the closure of forests in Arizona and New Mexico due to fire danger.

Source: Earth Observatory

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