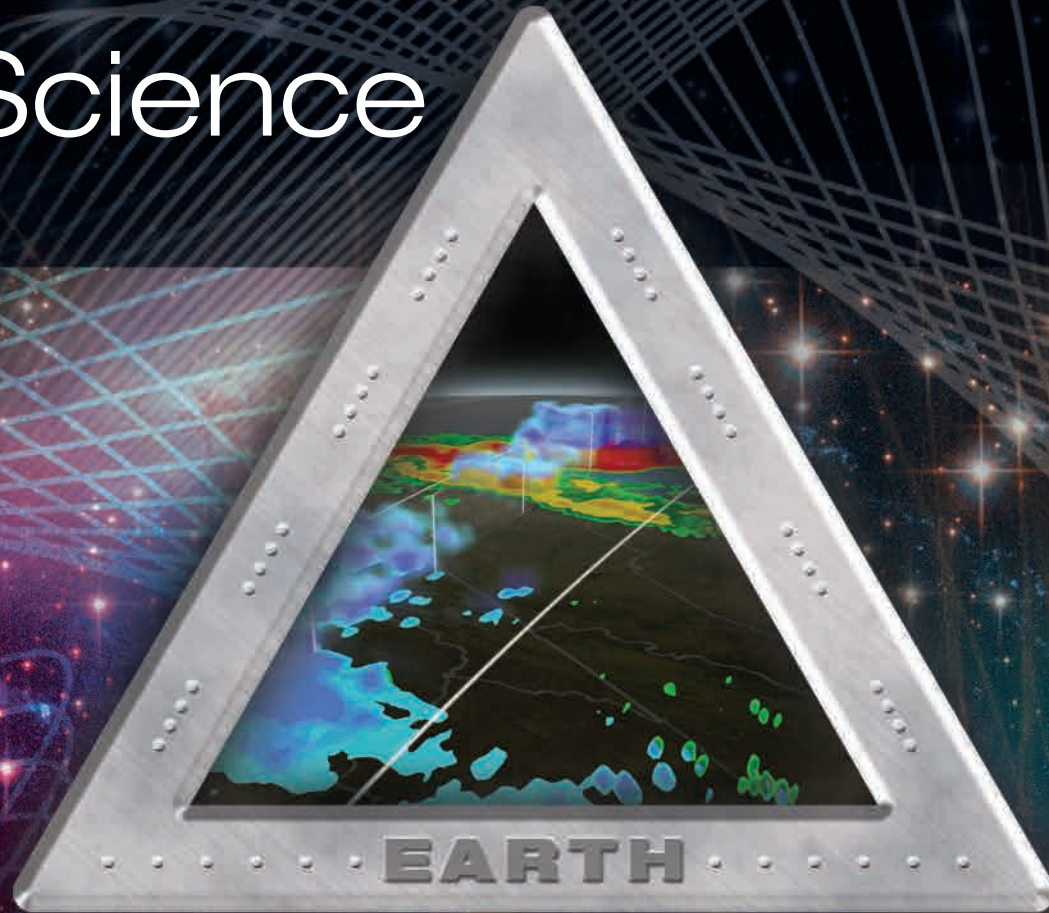
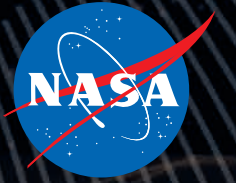
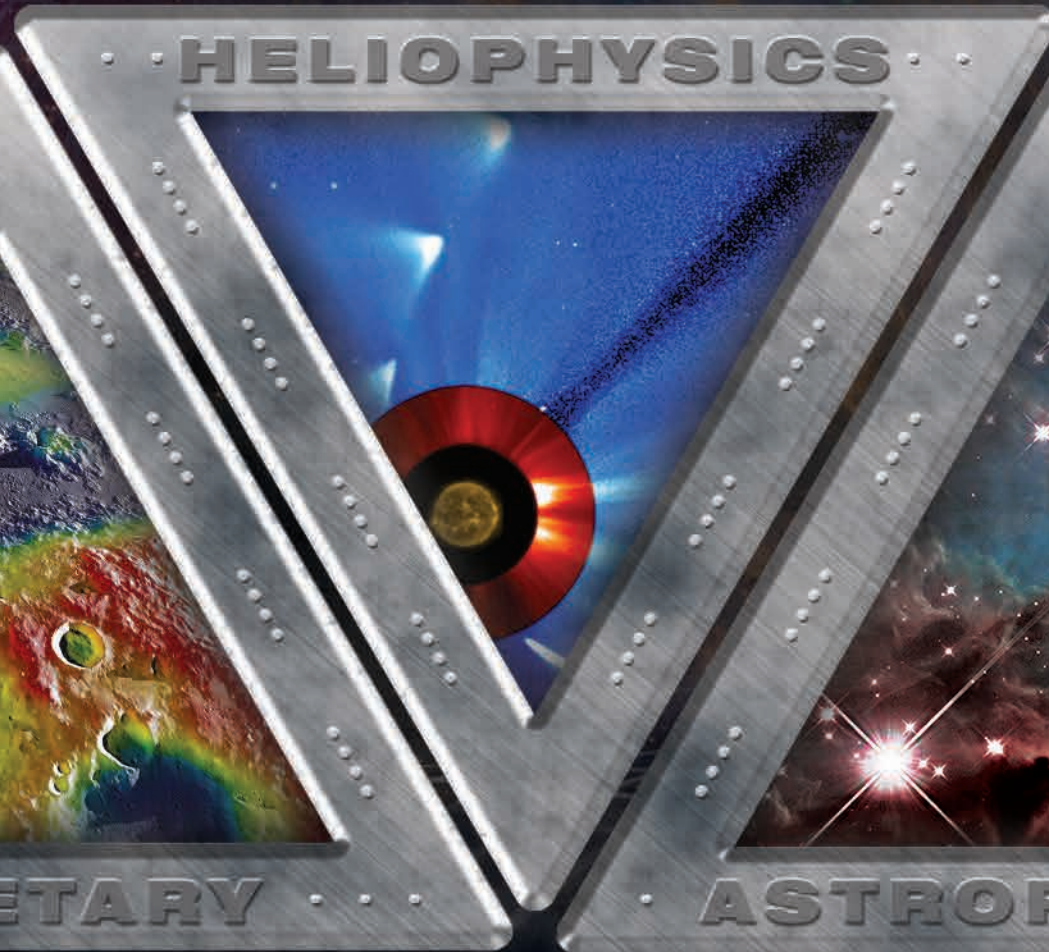


NASA Science

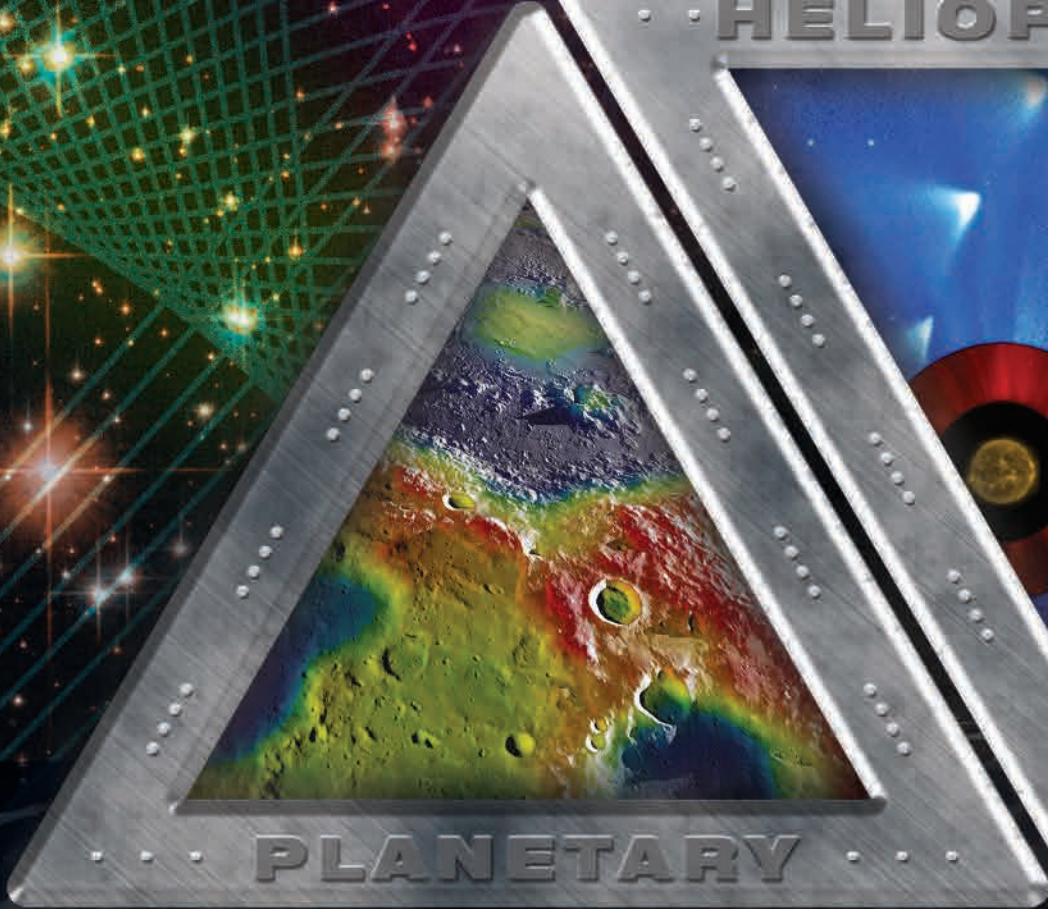
National Aeronautics and
Space Administration



EARTH



HELIOPHYSICS



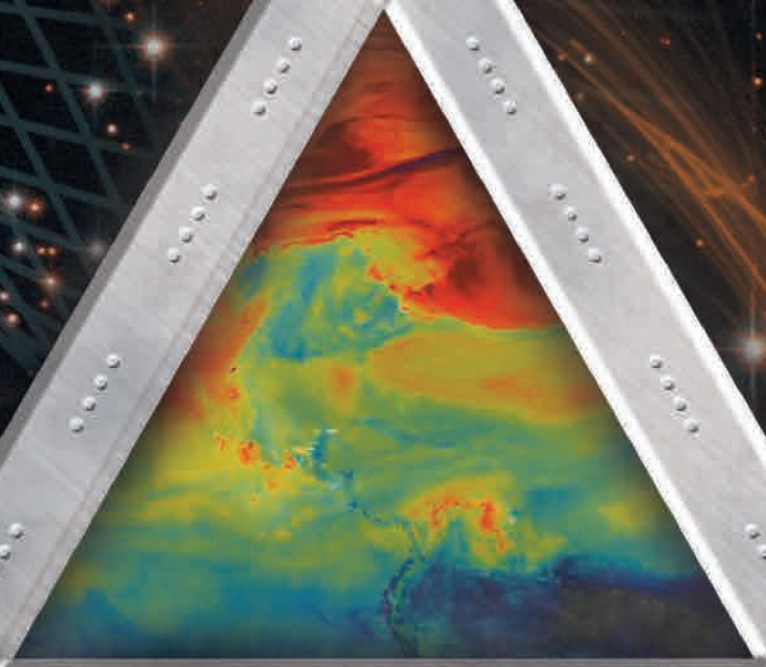
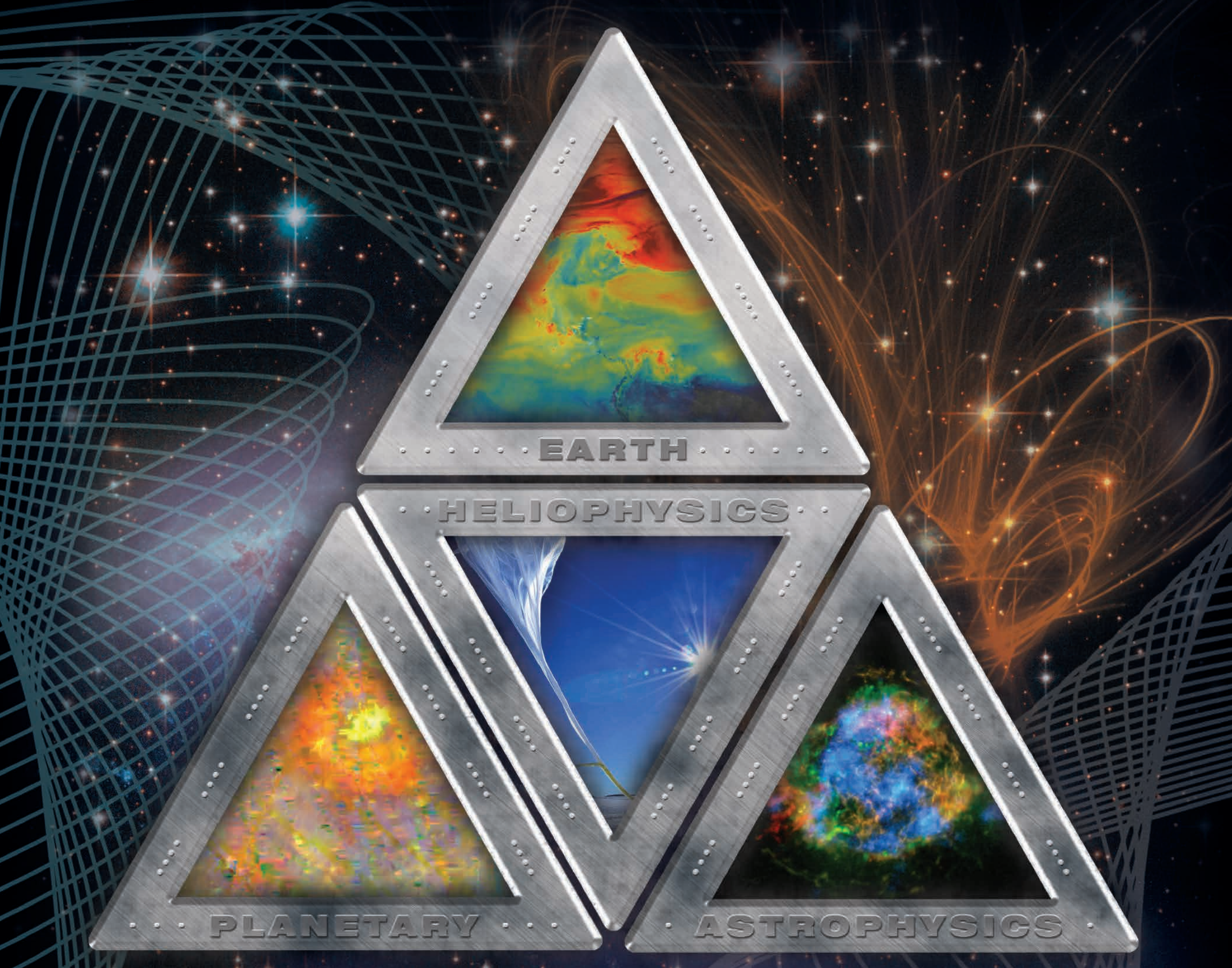
PLANETARY



ASTROPHYSICS

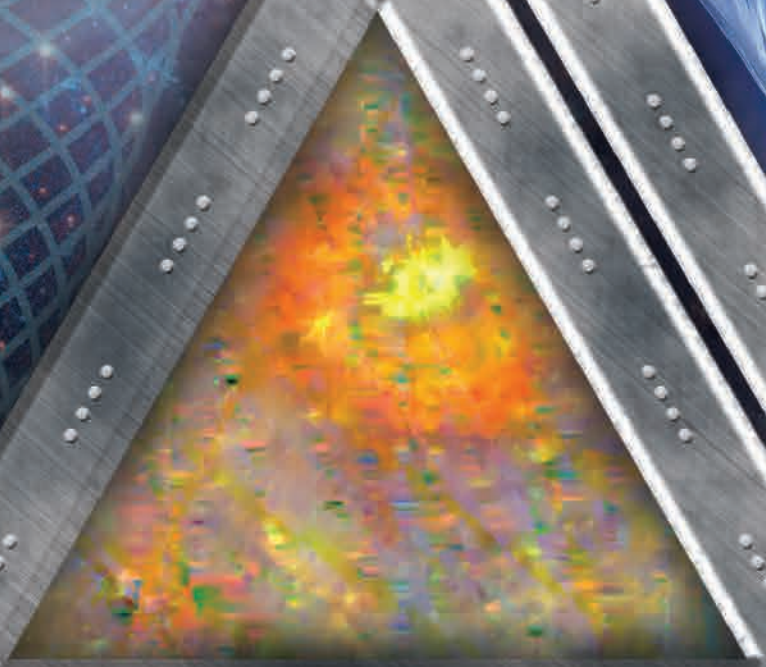
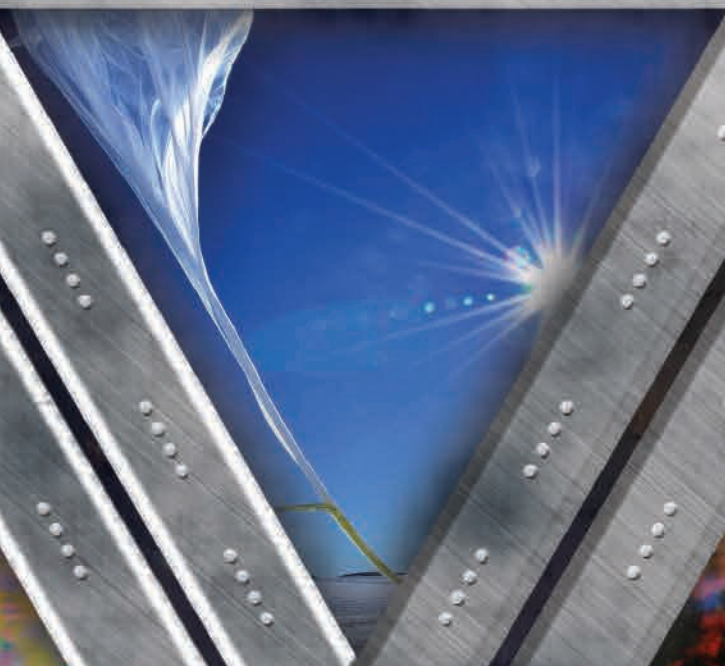
2015

www.nasa.gov

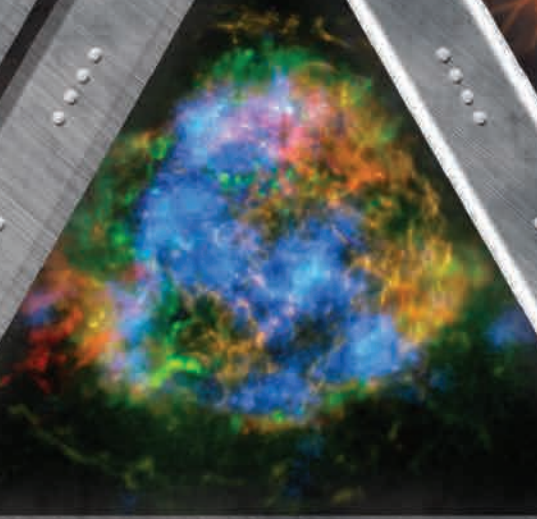


EARTH

HELIOPHYSICS

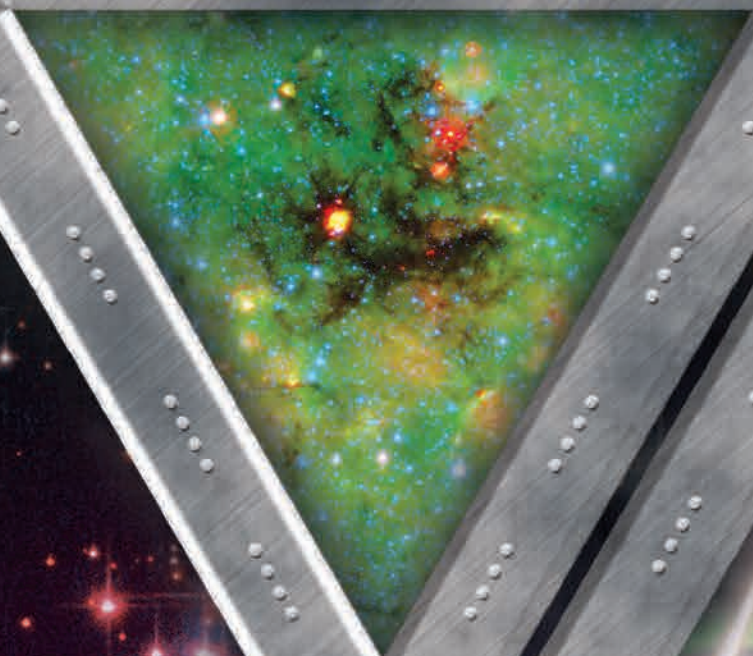


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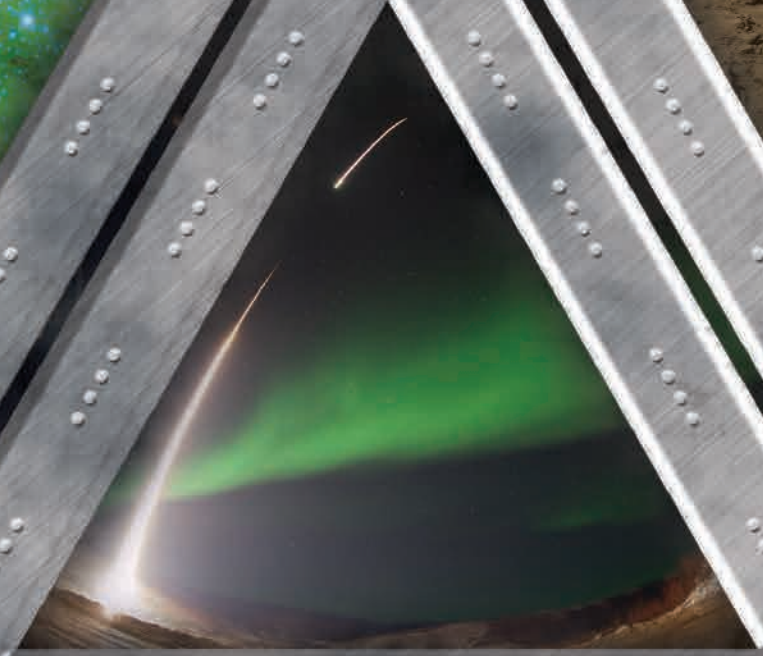
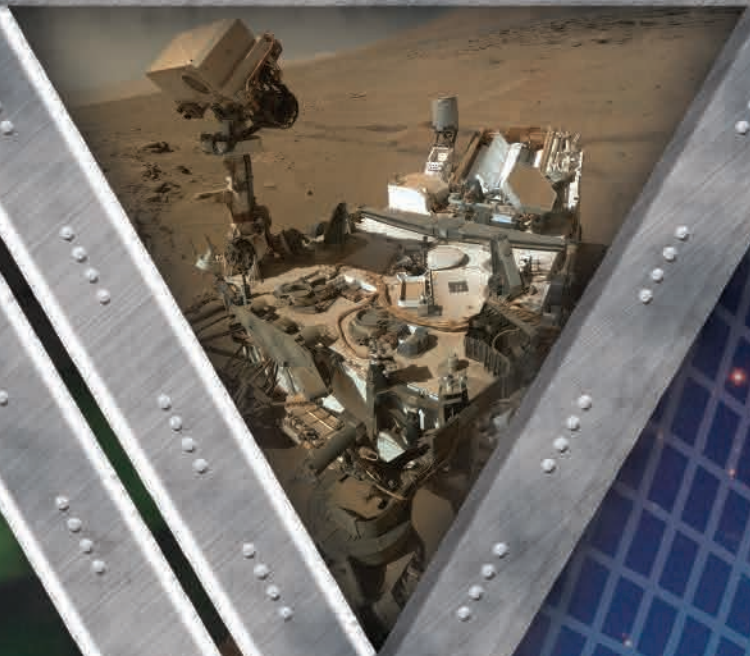


ASTROPHYSICS

ASTROPHYSICS



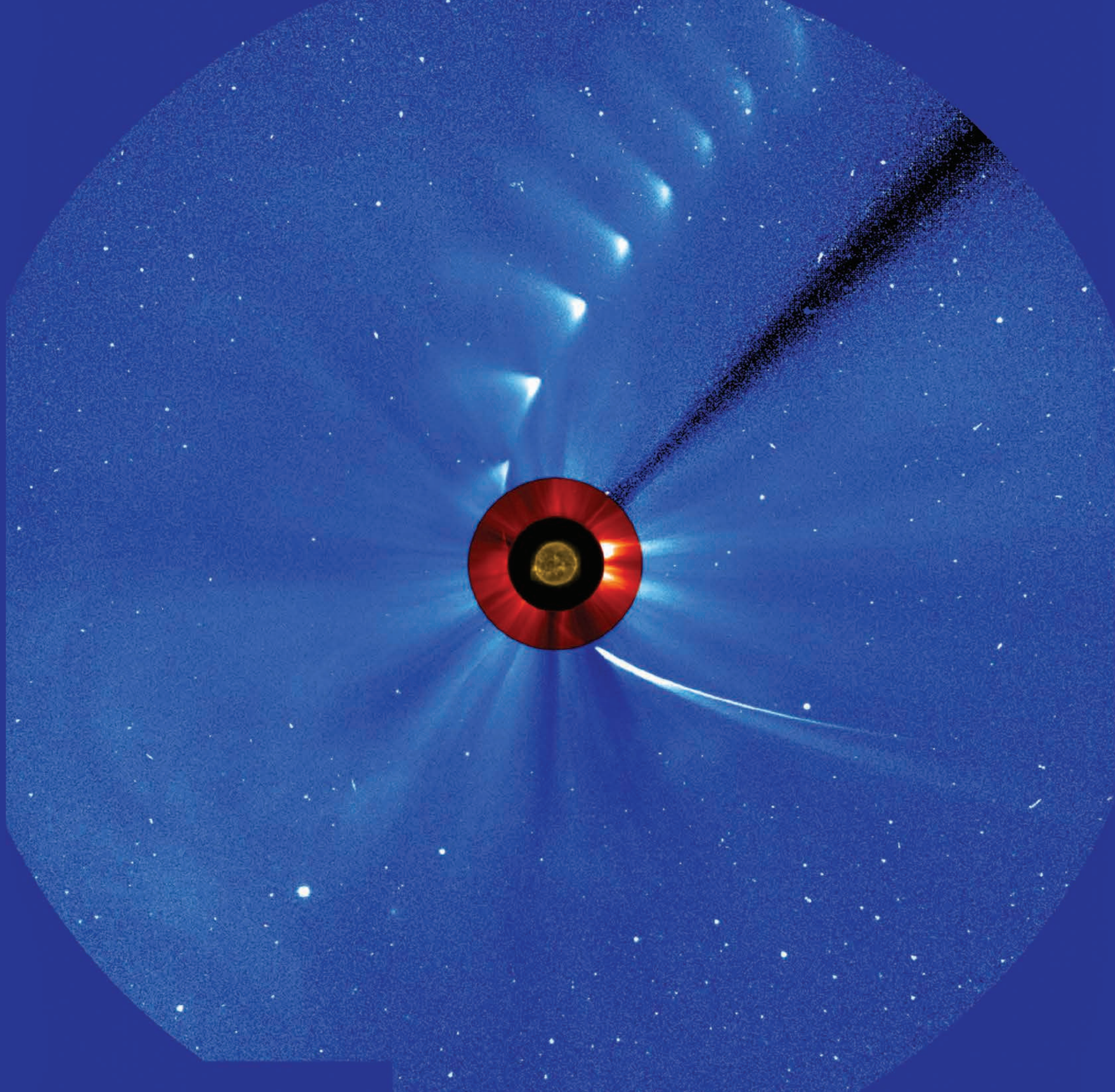
PLANETARY



HELIOPHYSICS

EARTH







Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
				New Year's Day		
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
	Birthday of Martin Luther King, Jr.					
25	26	27	28	29	30	31

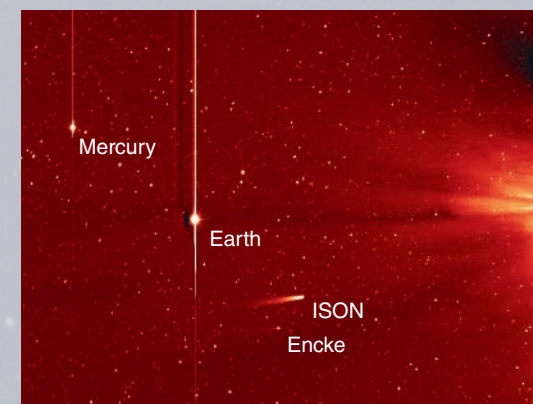
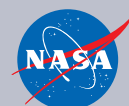
NASA Spacecraft Observe Comet ISON's Journey to the Sun

Discovered in September 2012 by two Russian scientists, Comet ISON is believed to have originated in the *Oort Cloud*—a “source region” for many comets, located on the fringe of the solar system—almost a light-year from Earth. ISON is made of pristine matter from the earliest days of the solar system's formation. It traveled through space for over a million years before it was first spotted by scientists on Earth. From the very beginning, they were intrigued by the discovery, not only because ISON had the potential to be very bright as it approached Earth, but also because this was the comet's very first trip into the inner solar system.

The image above shows a time-lapse image series of ISON as it made its trek around the sun from November 28 through December 1, 2013, as viewed by the joint European Space Agency (ESA)/NASA Solar and Heliospheric Observatory (SOHO). The time-lapse image is combined with an image of the sun (yellow-center) observed by NASA's Solar Dynamics Observatory (SDO), and an image of the solar atmosphere (the red ring and the outer blue region) observed by SOHO's two coronagraphs. ISON appears as a white streak approaching the sun and then as a bright ball of light after it looped around. During its trip towards the sun, the Heliospheric Imager aboard NASA's Solar Terrestrial Relations Observatory-A (STEREO-A) also observed ISON—see inset image at right.

In November 2013, researchers expected ISON to either break up due to the intense heat and gravity of the sun or slingshot around the sun and speed away, never to return. As ISON made its closest approach to the sun, the comet was not observed, leading scientists to believe it had disintegrated. However, something significantly less bright did reappear in later images. The question remained as to whether the bright spot seen moving away from the sun was debris, or whether a small nucleus of ISON was still intact. Regardless, it is likely that by December 1, 2013, there was no nucleus left.

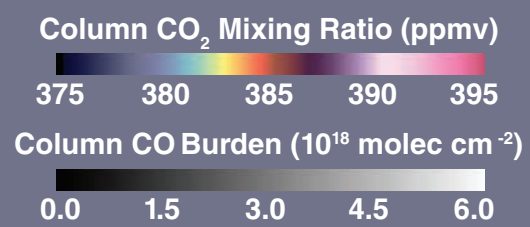
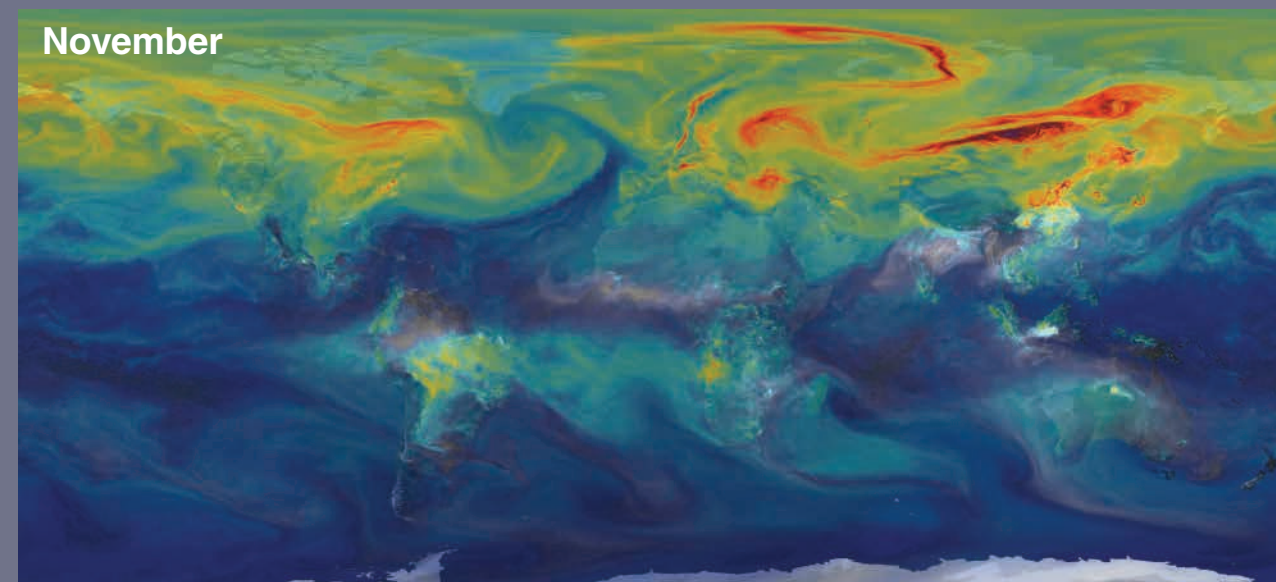
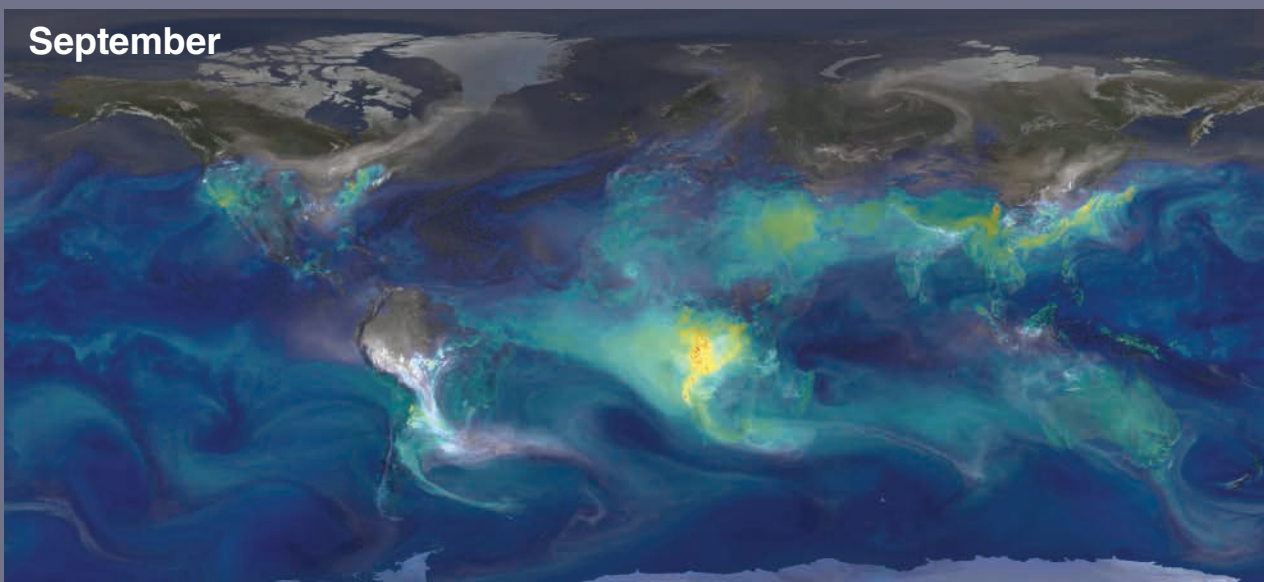
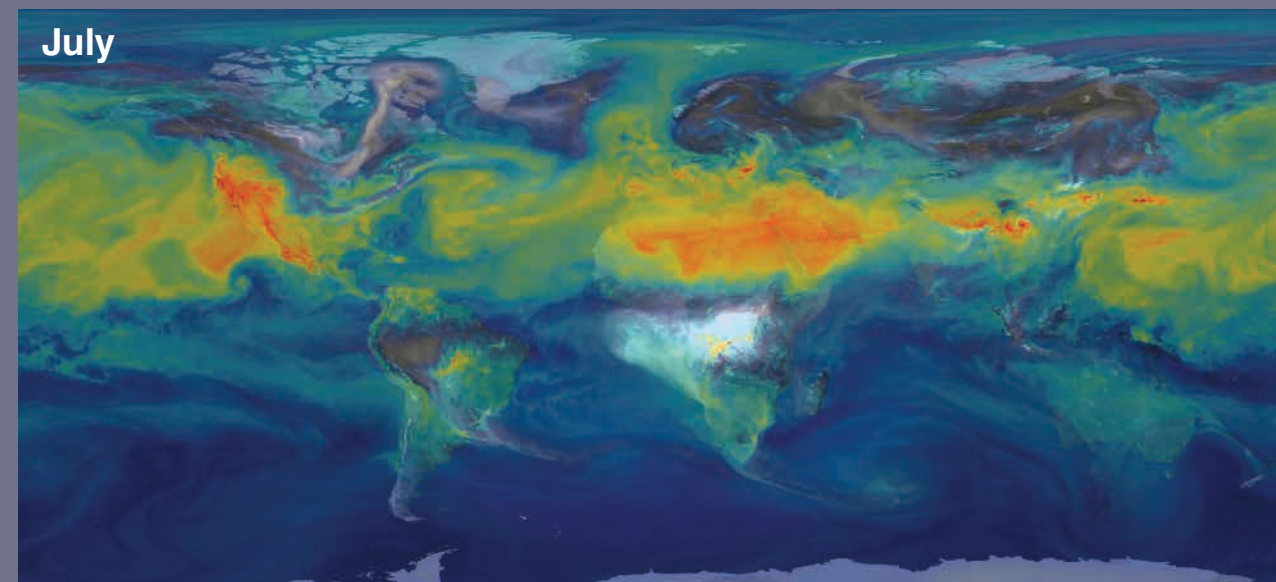
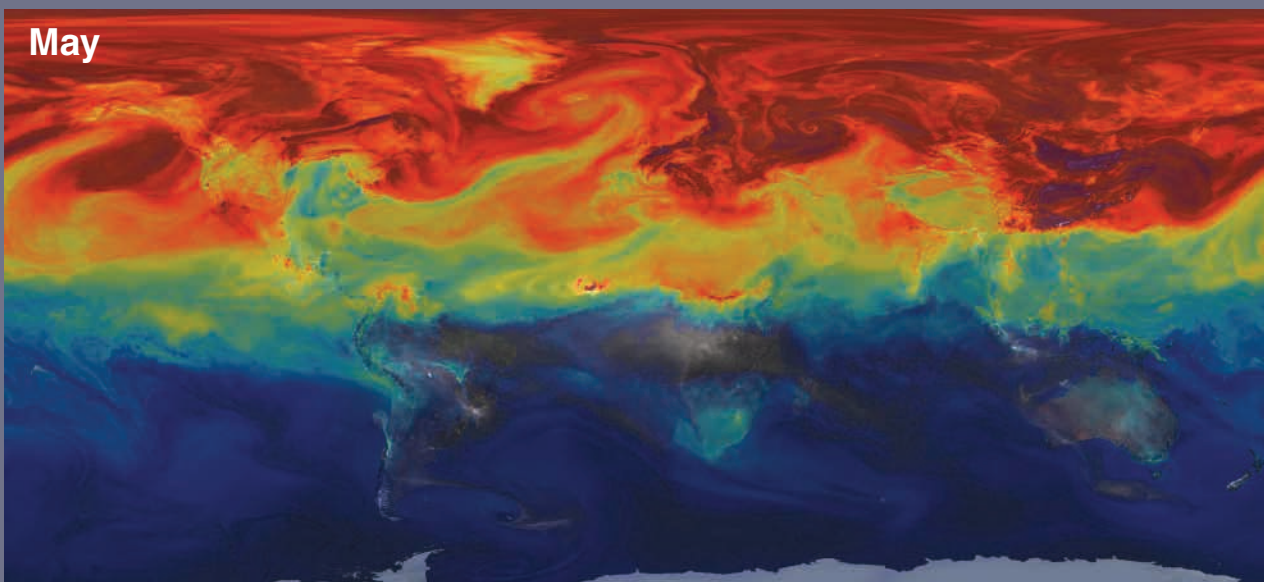
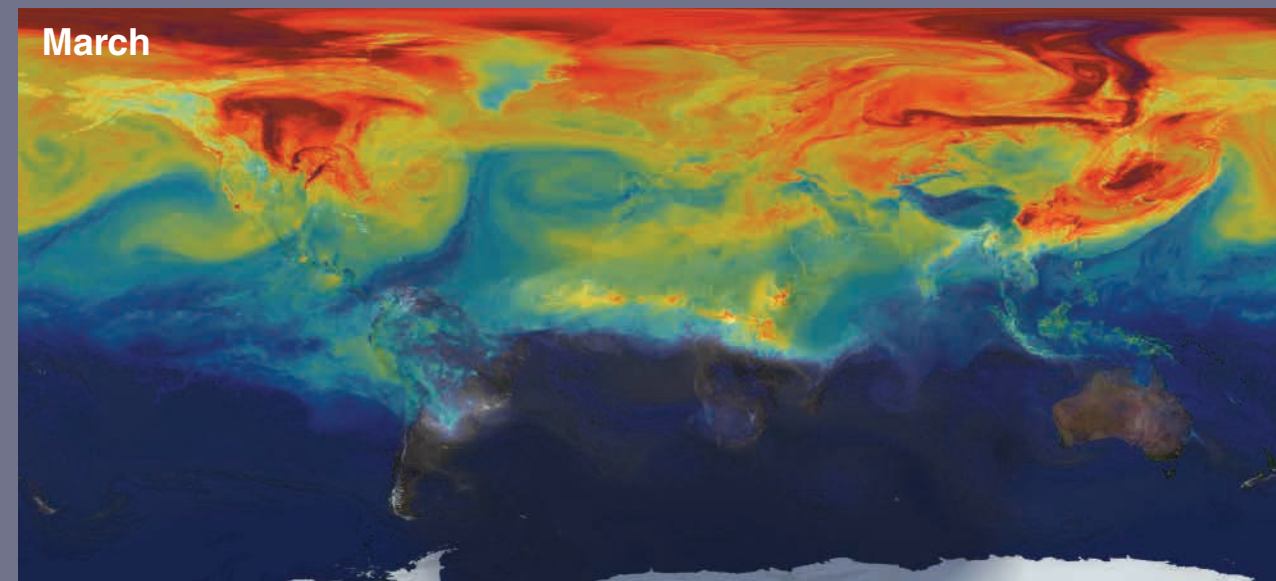
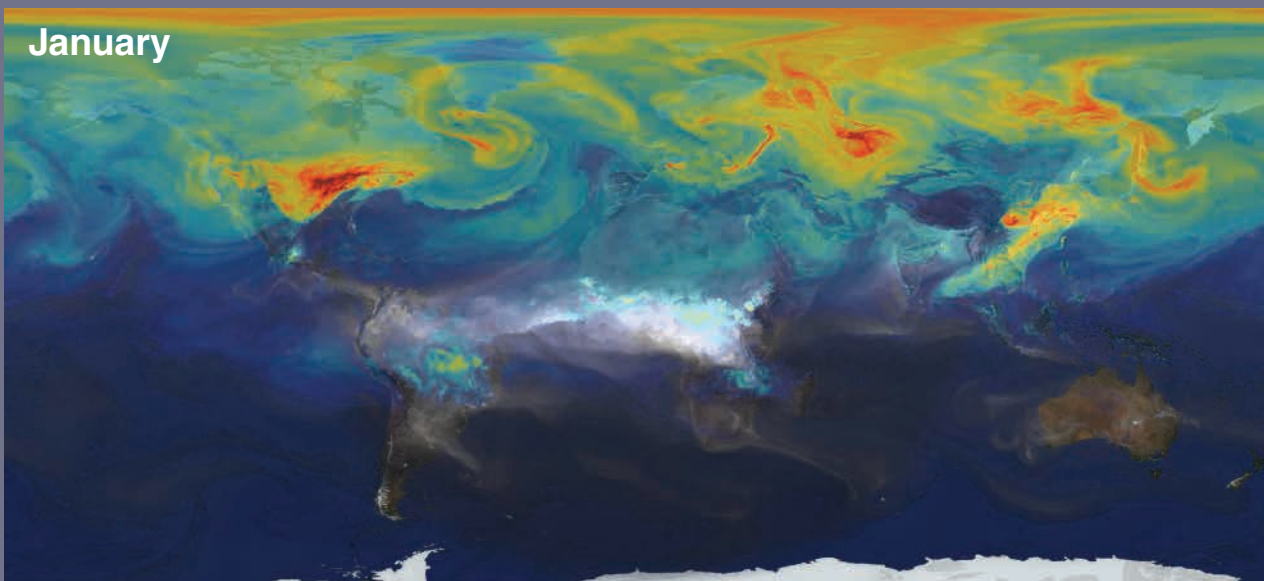
Image and partial text credit: ESA/NASA SOHO, NASA SDO



This image from STEREO-A shows ISON (along with Earth, Mercury, and Comet Encke) with the sun located to the right beyond the camera's view. When viewed from the unique vantage point of the STEREO-A spacecraft in November 2013, Earth appears closer to the sun than Mercury. Image credit: Naval Research Laboratory, NASA STEREO

December 2014						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2015						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28



February 2015



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 ●	4	5	6	7
8	9	10	11	12 ●	13	14
15	16	17	18 ●	19	20	21
22	23	24	25 ●	26	27	28

Washington's Birthday
(observed date)

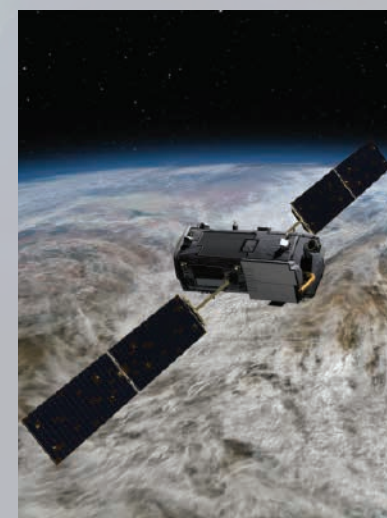
Simulated Atmospheric Carbon Concentrations

The images shown here come from the 7-kilometer horizontal resolution, Goddard Earth Observing System Model, Version 5 (GEOS-5) Nature Run model. This model has 1000 times more grid cells than typical global carbon dioxide (CO₂) models and incorporates input from a variety of other databases and satellite observations, detailed at svs.gsfc.nasa.gov/goto?30515. Shown here are maps of column-averaged concentrations of atmospheric CO₂ (colored shades) and column abundance of atmospheric carbon monoxide (CO) (white shades underneath) for the first day of the following months in 2006: January, March, May, July, September, and November.

CO₂ variations are largely controlled by fossil fuel emissions and seasonal fluxes of carbon between the atmosphere and land biosphere. For example, dark red and pink shades represent regions where CO₂ concentrations are enhanced by carbon sources—mainly from human activities. Trees and plants participate in the carbon cycle by “inhaling” CO₂ and converting it into organic plant matter as part of the process of photosynthesis, thus removing CO₂ from Earth’s atmosphere. During Northern Hemisphere spring and summer for example, atmospheric CO₂ decreases due to the large volume of new and growing vegetation, causing atmospheric CO₂ to reach a minimum in late summer (see July). Atmospheric CO, a pollutant harmful to human health, is produced mainly from fossil fuel combustion and biomass burning. In this case, high abundances of CO (white) are mainly from fire activity in Africa (see January and July) and South America (see September).

On July 2, 2014, NASA launched the Orbiting Carbon Observatory-2 (OCO-2) mission—NASA’s first remote sensing satellite dedicated to studying atmospheric CO₂ from space. In addition NASA already has several instruments in orbit that collect measurements of CO, including instruments on Terra (MOPITT), Aqua (AIRS), and Aura (TES)—the last two of which also measure CO₂. Data from OCO-2 combined with data from other sources will help scientists answer important questions about Earth’s carbon cycle and changing climate.

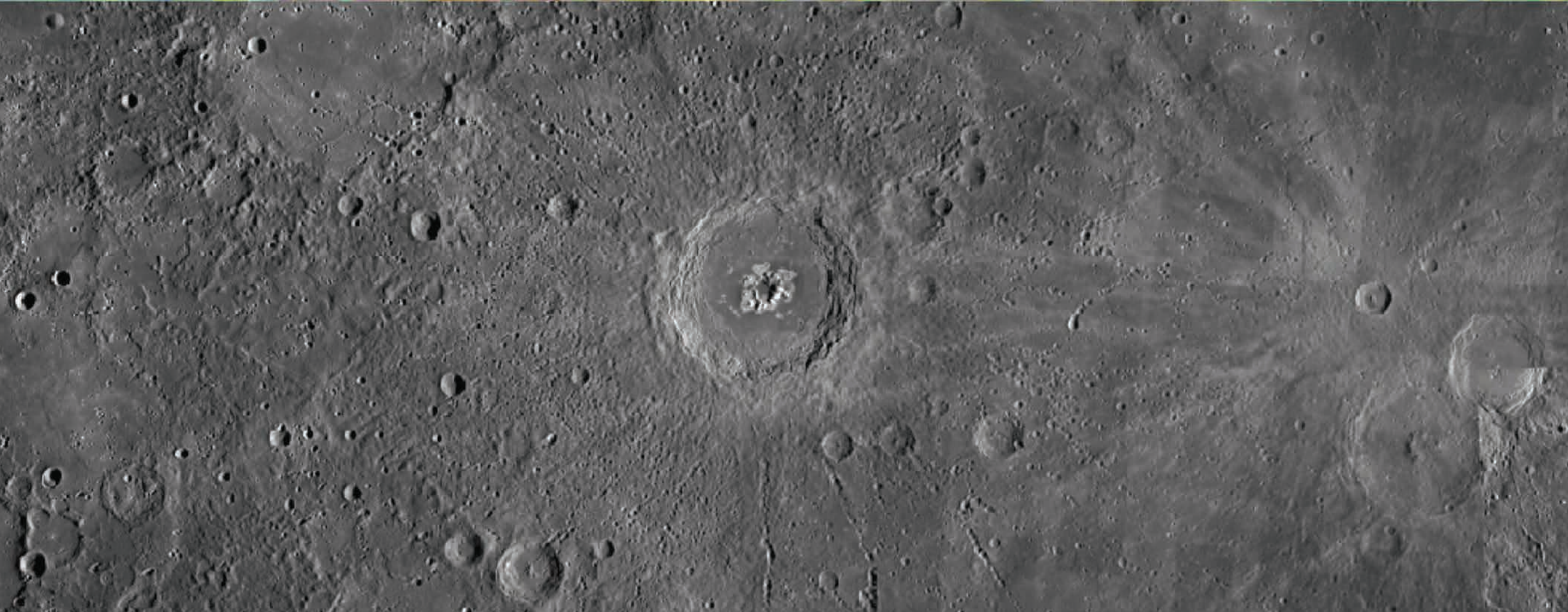
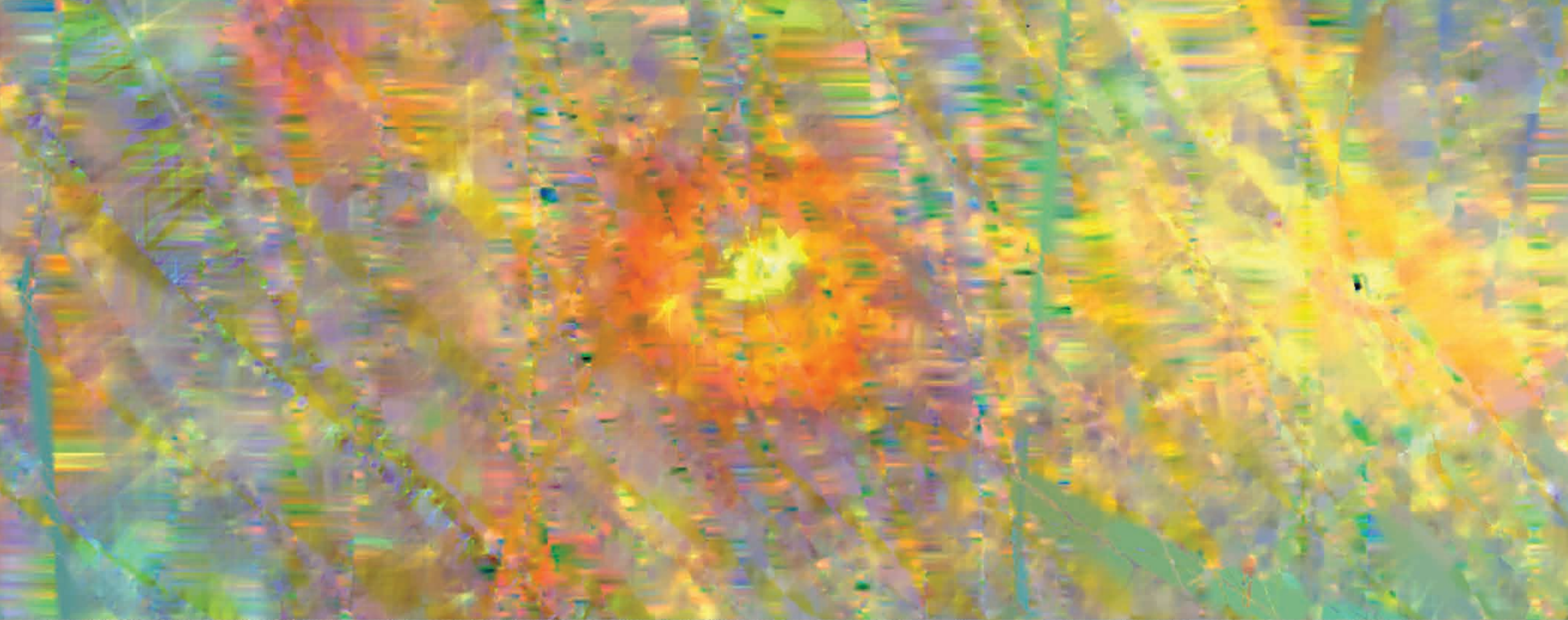
Image and partial text credit: NASA’s Global Modeling and Assimilation Office



Artist's concept of OCO-2. Image credit: NASA/Jet Propulsion Laboratory

January 2015						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

March 2015						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				



March 2015



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5 ●	6	7
8	9	10	11	12	13 ●	14
Daylight Savings Time Begins						
15	16	17	18	19	20 ●	21
22	23	24	25	26	27 ●	28
29	30	31				

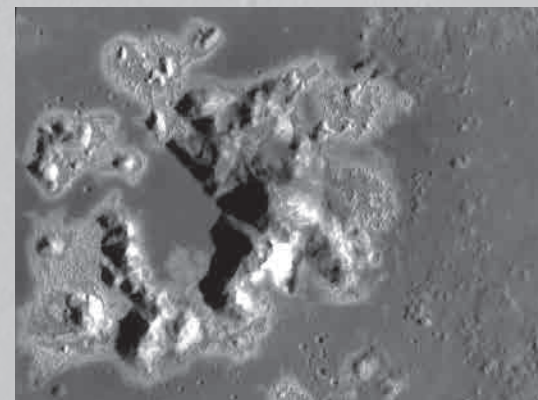
Peek-a-Boo Eminescu

NASA's Mercury Surface, Space Environment, Geochemistry, and Ranging (MESSENGER) satellite has been orbiting the planet Mercury since March 2011. Data from MESSENGER have revealed a broken and distorted landscape pockmarked with craters ranging from tiny bowls to multi-ringed basins.

The images here show a prominent crater named Eminescu (*center*) that scientists believe formed more recently than most of the craters on Mercury—since there are very few later craters superposed on it. The bottom image is a monochrome mosaic created using data from MESSENGER's Mercury Dual Imaging System (MDIS) that provides a view of the crater much like our two eyes would see. Impressive chains of secondary craters, formed by material ejected by the impact explosion that formed the crater, radiate away from Eminescu. The central peaks within the crater are arranged in a circular pattern; geologists call this type of crater a *peak ring crater*.

The top image is an interpolated, color composite from the Mercury Atmosphere and Surface Composition Spectrometer (MASCS) Visible and Infrared Spectrograph (VIRS) onboard MESSENGER. MASCS is sensitive to light from the infrared to the ultraviolet and measures the abundances of atmospheric gases, as well as detects minerals on the surface. Yellow areas correspond to high values in both the red and green channels, that is, highly reflective surfaces (at 575 nm). In some cases high reflectance values are associated with fresh material that has been less affected by space weathering. *Hollows*—strange depressions in the surface with origins not yet fully understood—such as those found on and around the central peak of Eminescu, have similar yellow colors.

Image and partial text credit: NASA, Johns Hopkins University's Applied Physics Laboratory, Carnegie Institution of Washington



This view of Eminescu's peak ring crater, acquired by MDIS, focuses on the haloed hollows on the floor and bright slopes of the peaks. Image credit: NASA, Johns Hopkins University's Applied Physics Laboratory, Carnegie Institution of Washington

February 2015

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

April 2015

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		





Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	11
12 	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Hubble Observes a Nearby Star Factory

For a quarter-century, NASA's Hubble Space Telescope has been providing amazing images of the universe, leading to exciting new science discoveries. The colorful Hubble mosaic shown here unveils a small portion of the Monkey Head Nebula (also known as NGC 2174 and Sharpless Sh2-252), located about 6400 light-years from Earth in the constellation of Orion. Nebulas, often star-forming regions, are interstellar clouds of dust, hydrogen, helium, and other ionized gases. This particular nebula contains all the necessary ingredients for star formation.

Massive, newly formed stars can be seen near the center of the nebula (and toward the right in the image). The presence of these young, fiery, bright stars trigger high-velocity winds that help carve the nebula's remaining dust into giant dark-brown and rust-colored pillars. Ultraviolet light from the stars also warms the dust particles near the center of the nebula, making them glow at infrared wavelengths. Over time, the nebula will continue to expand outward and dissipate. The image demonstrates the powerful infrared capabilities offered by Hubble's Wide Field Camera 3 (WFC3). Hubble launched in 1990 from Space Shuttle *Discovery* on mission STS-31; the observatory celebrates 25 years in orbit on April 24.

Image and partial text credit: NASA, European Space Agency (ESA), and the Hubble Heritage Team [Space Telescope Science Institute/Association of Universities for Research in Astronomy (STScI/AURA)]



These images show a visible and infrared comparison of NGC 2174. On the left is a visible-light image made by Hubble's Wide-Field Planetary Camera 2 (WFPC2) in 2001 and on the right is an image made by the WFC3 infrared camera in 2014. Image credit: NASA, ESA

March 2015

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

May 2015

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	25	26	27	28	29	30



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4 	5	6	7	8	9
10	11 	12	13	14	15	16
Mother's Day	17	18	19	20	21	22
	23	24	25	26	27	28
31	29	30				
	Memorial Day 					

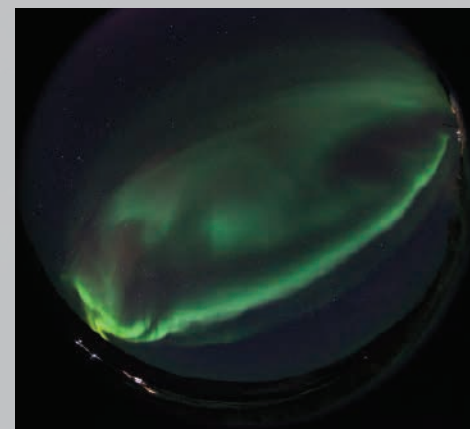
NASA Sounding Rocket Launches Into Aurora Over Alaska

An aurora occurs when particles from the sun funnel into Earth's magnetosphere, generate electric currents, and trigger a shower of particles that strike oxygen and nitrogen some 60 to 200 miles (~95 to 320 kilometers) up in our atmosphere, releasing a flash of light. Scientists are eager to learn more about the environment that gives rise to these beautiful but fleeting atmospheric phenomena. To that end, on March 3, 2014, a NASA-funded mission known as the Ground-to-Rocket Electrodynamics-Electron Correlative Experiment, or GREECE, launched from Poker Flat Research Range on a 10-minute express flight directly into the heart of an aurora. The sounding rocket reached its zenith over the native village of Venetie, Alaska, where an array of ground-based imagers were positioned to take measurements of the particles and electric fields within the aurora.

This photograph shows the rocket launching toward the aurora. GREECE observed classic curls in the aurora in the night sky that look like cream swirling in a cup of coffee—see inset image at right. The mission's goal was to understand what combination of events sets up these auroral curls in the charged, heated gas—or *plasma*—where aurorae form. This information improves our understanding of the sun-Earth connection and how energy and particles from the sun interact with Earth's own magnetic system—the *magnetosphere*.

GREECE is a collaborative effort between Southwest Research Institute, which developed particle instruments and the ground-based imaging, and the University of California, Berkeley, measuring the electric and magnetic fields. A team from NASA's Wallops Flight Facility supported the launch at the Poker Flat Research Range, which is operated by the University of Alaska, Fairbanks.

Image and partial text credit: NASA



To study the aurora's curl structures, GREECE employed both ground-based imagers and a sounding rocket launched into the middle of the aurora. Image credit: NASA

April 2015						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

June 2015						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July 2, 2011

June 24, 2014

Coast Range

Coast Range

— San Francisco —

— San Francisco —

Yosemite —


Yosemite —


Sierra Nevada

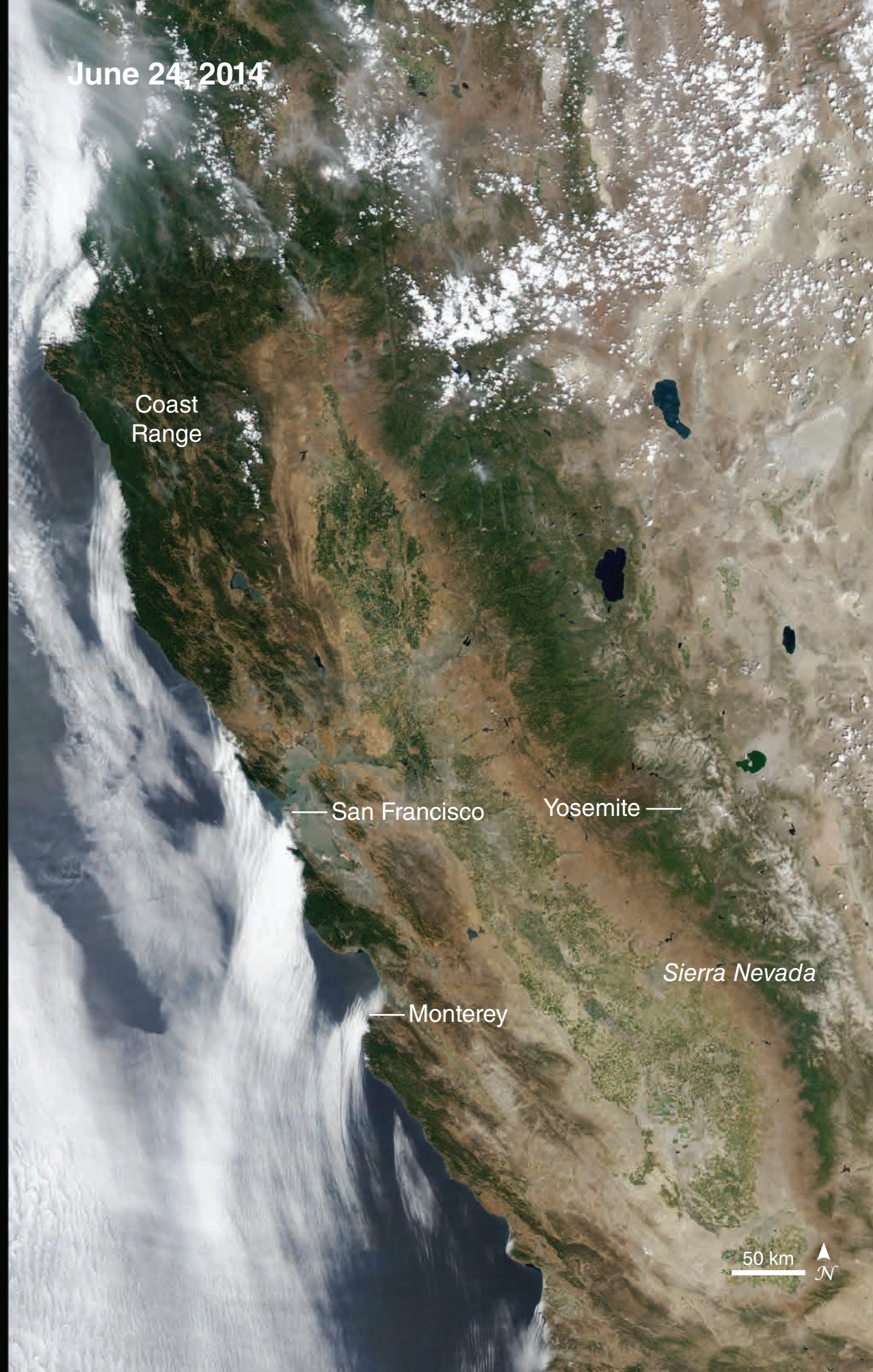
Sierra Nevada

— Monterey —

— Monterey —

50 km 

50 km 



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
Flag Day	21	22	23	24	25	26
Father's Day	28	29	30			

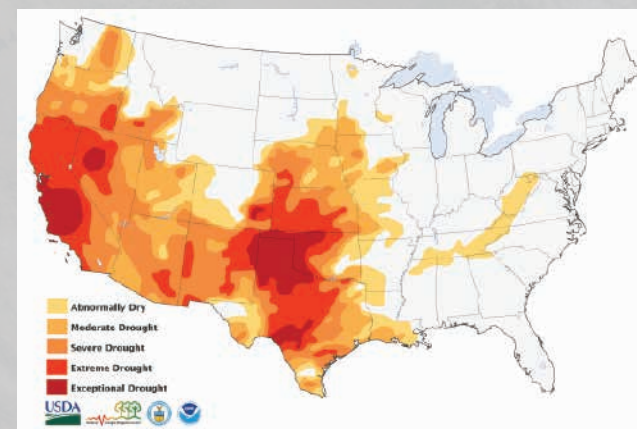
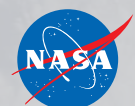
Extreme Drought Situation in California

The drought in California has continued to grow worse with each month in 2014. In a weekly report issued on August 14, 2014 by the U.S. Drought Monitor, nearly the entire state of California was classified as being in severe drought (99.8%). The situation was declared extreme for ~82% of the state's land area and exceptional—the highest intensity—in ~58% of the state. This pair of images from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captures a wide view of the situation from space. The image on the right was acquired on June 24, 2014; the image on the left shows the same landscape on July 2, 2011—just as the latest dry period began.

Near the Pacific coast, some mountain forests are holding on, but much of the area around the Coast Range has browned considerably. The green farmlands that were visible in the state's Central Valley in 2011 are much less robust in 2014. Just north of Yosemite National Park, the land is not only brown from drought, it is also scarred from the Rim Fire and other blazes in 2013. In the Sierra Nevada, the snow cover has decreased significantly, and what remains has a tan or gray tint from dust and soil.

This browning of California has been underway for quite some time. While as of May 6, 2014, half of the United States was experiencing some level of drought (see inset image at right) the situation is particularly severe in California, where precipitation has averaged just 67% of normal over the past three years. According to the U.S. Drought Monitor and the National Climatic Data Center, the July 2013 to June 2014 period has been the warmest on record for the state—and the third driest since 1895.

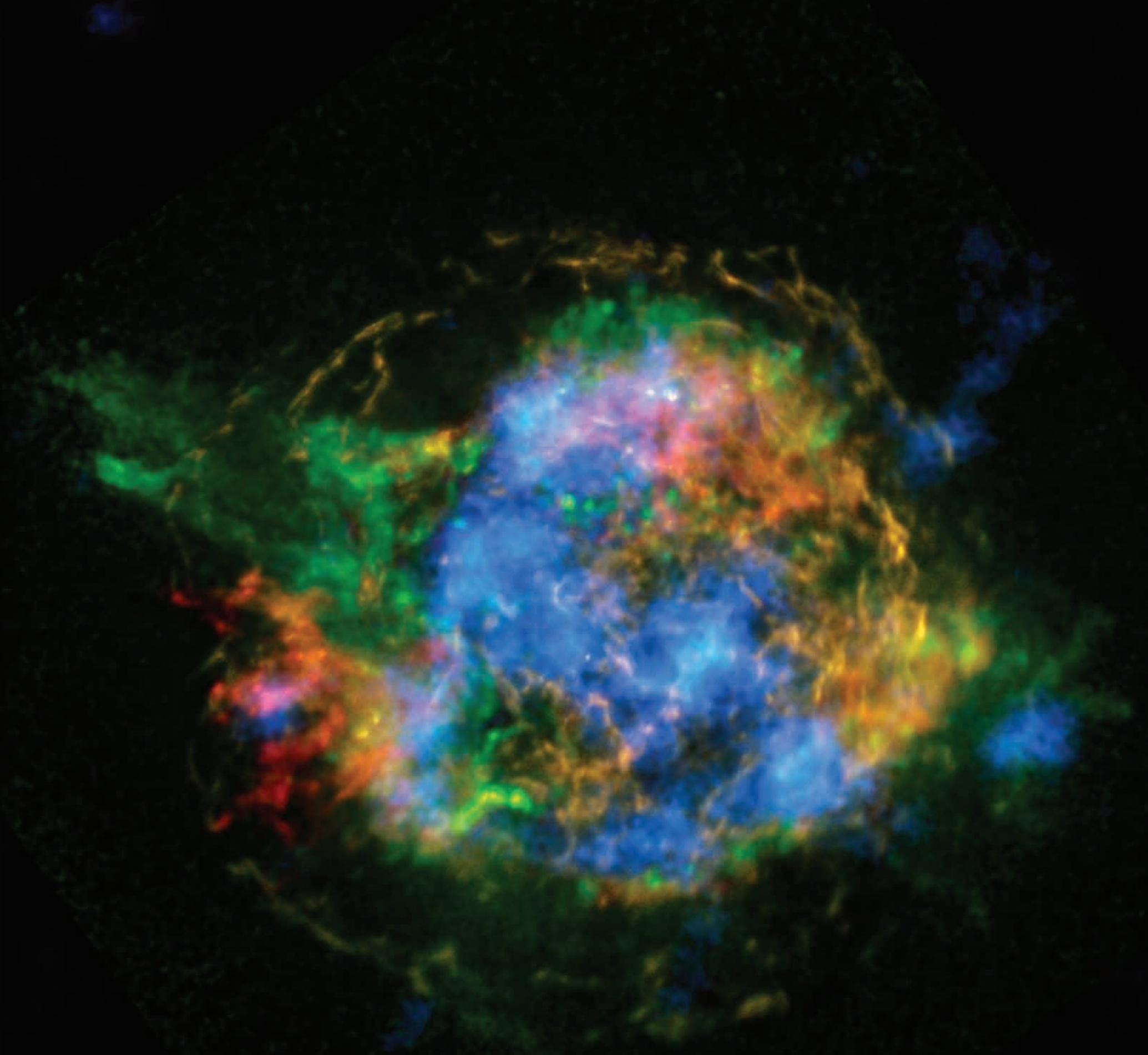
Image and partial text credit: NASA's Earth Observatory



The map above depicts areas of drought across the U.S. in progressive shades of orange on May 6, 2014. The map was developed by the U.S. National Drought Monitor, a partnership of the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration, and the University of Nebraska-Lincoln.

May 2015						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

July 2015						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	



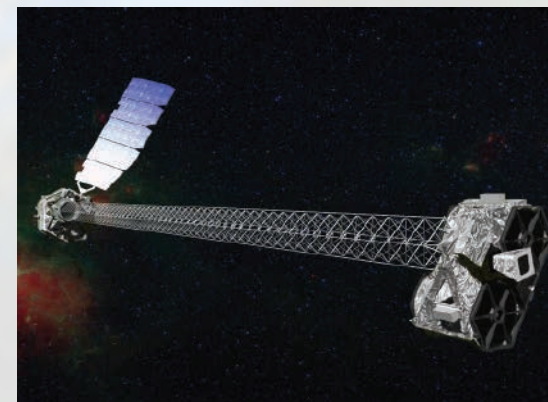
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
				●		Independence Day
5	6	7	8	9	10	11
			●			
12	13	14	15	16	17	18
				●		
19	20	21	22	23	24	25
					●	
26	27	28	29	30	31	
					●	

Untangling the Remains of Cassiopeia A

Located 11,000 light-years away from Earth Cassiopeia A is one of astronomy's most famous supernova remnants. It was created when a massive star exploded into space leaving behind a dense stellar corpse and its ejected remains. How supernovas explode has been a mystery for a long time. With the help of NASA's Nuclear Spectroscopic Telescope Array (NuSTAR), we are gaining new insights on how stars detonate. NuSTAR has created the first map of radioactive material in a supernova remnant.

This NuSTAR image of Cassiopeia A shows the radioactive isotope titanium-44 (blue)—a direct tracer of the supernova blast—is concentrated in clumps at the core, which supports a theory referred to as *mild asymmetries*. In this scenario, material “sloshes” about at the heart of the supernova, reinvigorating a shock wave and allowing it to blow out the star's outer layers. These NuSTAR data complement previous observations made by the Chandra X-ray Observatory, which show non-radioactive elements, such as iron (red), silicon (green), and magnesium (green) that were heated by shock waves farther out from the remnant's center. The yellow is what astronomers call continuum emission, and represents a range of X-ray energies.

Image and partial text credit: NASA/Jet Propulsion Laboratory (JPL)-California Institute of Technology (Caltech), Chandra X-ray Center, Smithsonian Astrophysical Observatory



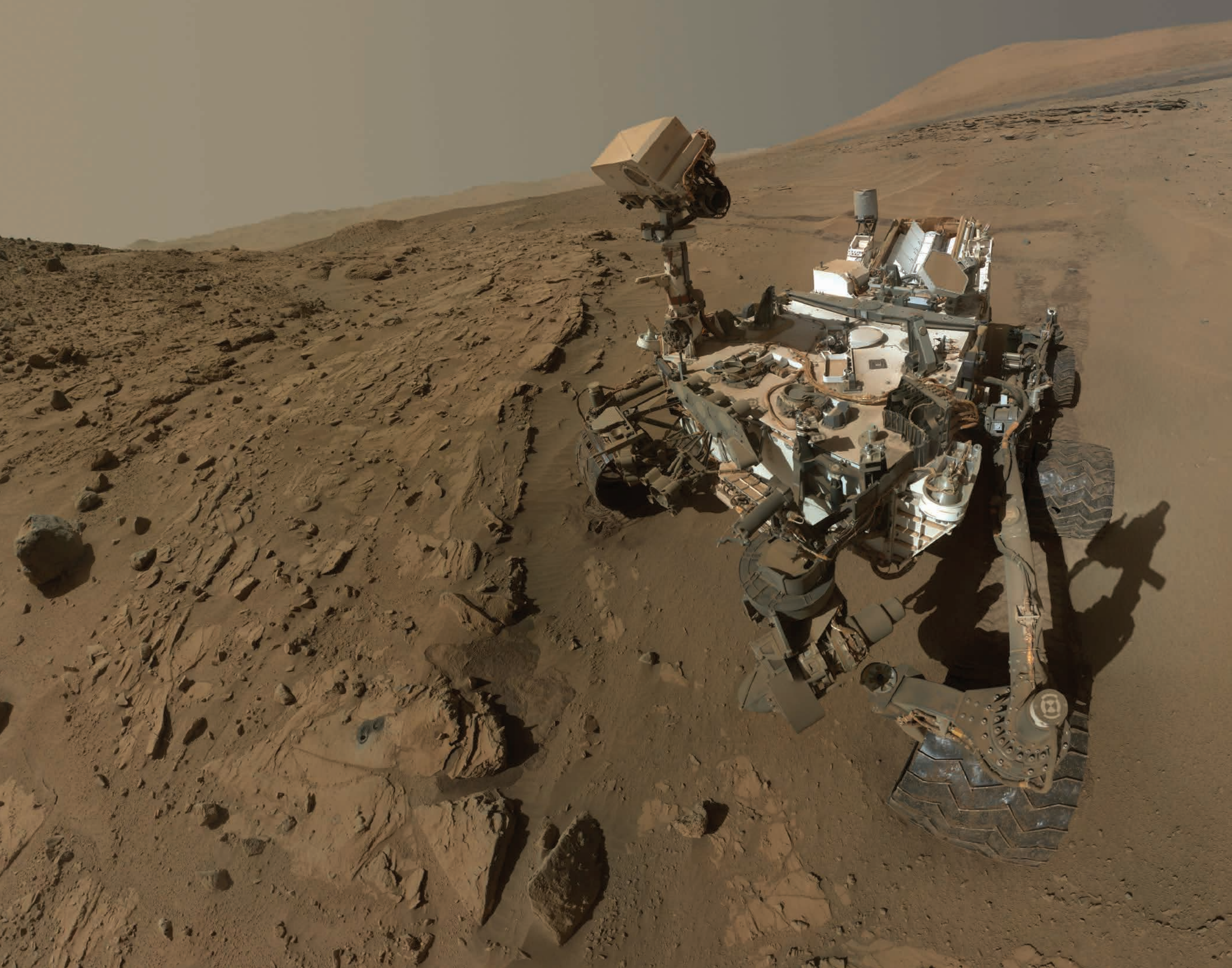
Artist's concept of NuSTAR on orbit. Image credit: NASA/JPL-Caltech

June 2015

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

August 2015

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					



August 2015



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

Postcard from Curiosity

Like a traveller sending a postcard from their latest destination, NASA's Curiosity Mars rover has sent back another "self portrait" from an important site along its journey—the third such photo produced. Using the Mars Hand Lens Imager (MAHLI) at the end of its arm, Curiosity captured dozens of photos of itself, which were then combined to produce this composite image of the rover after drilling into a sandstone target called Windjana. Most of the component frames of this mosaic view were taken during the 613th Martian day, or *Sol*, of Curiosity's work on Mars (April 27, 2014). Frames showing Windjana after completion of the drilling were taken on Sol 627 (May 12, 2014). The hole was drilled on Sol 621 (May 5, 2014).

The view does not include the rover's robotic arm, which was positioned out of the shot while these images were obtained. It does however include the hole in Windjana produced by the hammering drill on Curiosity's arm as it collected a sample of rock powder from the interior of the rock. The hole is surrounded by grayish cuttings on top of the rock ledge to the left of the rover. The Mast Camera (Mastcam) atop the rover's remote sensing mast is pointed at the drill hole. A Mastcam image of the drill hole from that perspective is shown in the inset image at right.

August 5, 2015 marks the third anniversary of Curiosity's landing on the surface of Mars. The rover continues to work its way up the rugged slopes of Mount Sharp, which rise about 3.4 miles (5.5 kilometers) above Gale Crater. Along the way, it has been using its 10 instruments to study the composition of the Martian surface and search for any signs that this area could have ever supported life.

Image and partial text credit: NASA/Jet Propulsion Laboratory (JPL)—California Institute of Technology (Caltech), Malin Space Science Systems (MSSS)



Close-up view of the Windjana drill hole from Curiosity's Mastcam. Image credit: NASA/JPL-Caltech, MSSS

July 2015

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September 2015





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September 2015



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13 	Labor Day	14	15	16	17	18
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BARREL Research Balloons Take to the Skies

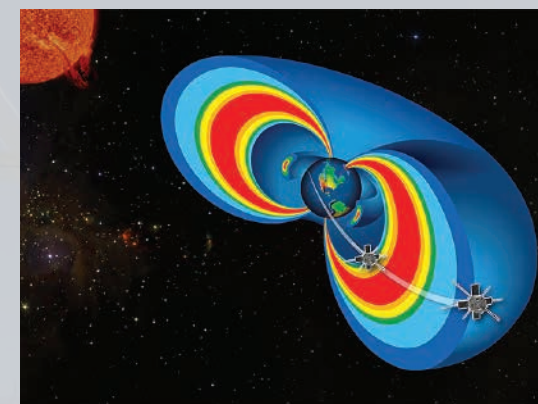
On August 30, 2012, NASA launched the twin Radiation Belt Storm Probes, now renamed the Van Allen Probes after American space flight pioneer James Van Allen. These probes directly monitor the radiation belts surrounding Earth to better understand how and why this region of near-Earth space exhibits such dynamic behavior. To complement the satellite measurements, NASA selected a multiple-balloon investigation called Balloon Array for Radiation belt Relativistic Electron Losses (BARREL), which directly measures X-rays produced by the high-energy electron particles ejected, or precipitated, from the Belts that make their way into Earth's atmosphere.

During January 2013 and January 2014, BARREL launched a total of 40 identical payloads from two different locations in Antarctica. The launch depicted in this photo occurred on January 30, 2013 at the South African National Antarctic Expedition IV base, which can be seen in the lower center of the image roughly a mile behind the launch site. Other launches took place at the British Halley Bay VI station.

BARREL balloons measure 130 feet (~40 meters) in length (pre-launch) and are made of a polyethylene film roughly ten times thinner than a human hair. The average BARREL flight carried its payload to an altitude of 125,000 feet (~38 kilometers) and lasted nearly two weeks. As more balloons launched, more observation points were added, giving scientists a complete picture of where the "electron precipitation" occurs.

Logistical support for BARREL in Antarctica is provided by the U.S. National Science Foundation through the U.S. Antarctic Program, the South African National Space Agency, and the British Antarctic Survey.

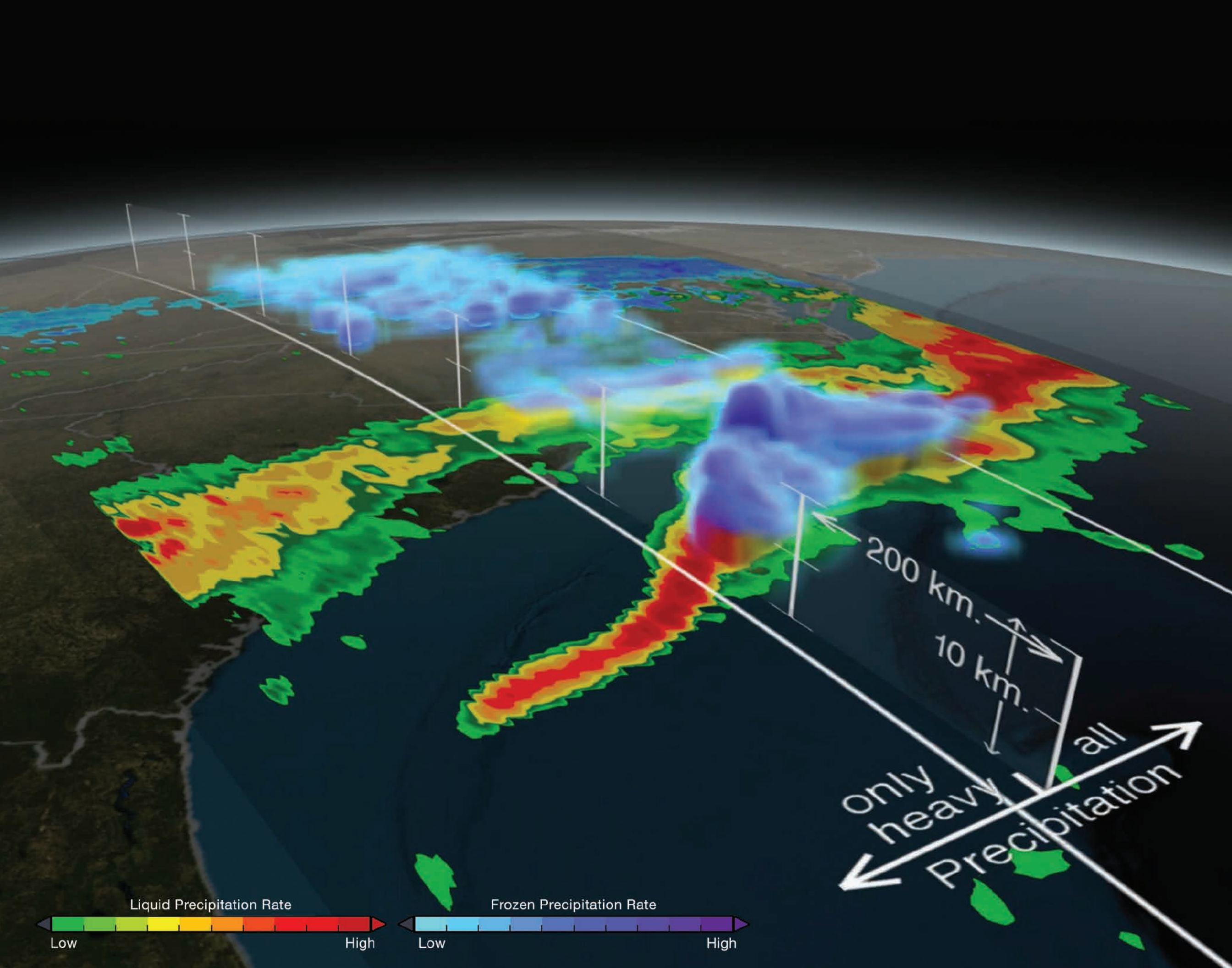
Image and partial text credit: Brett Anderson, Dartmouth College/NASA



Shown above is an artist's concept of NASA's Van Allen Probes orbiting through two giant radiation belts surrounding Earth studying how particles from those belts can be sped up to nearly the speed of light. Image credit: NASA

August 2015						
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October 2015						
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25	26	27	28	29	30	31



Liquid Precipitation Rate

Frozen Precipitation Rate

Low

High

Low

High

200 km.
10 km.

only heavy
all
Precipitation

October 2015



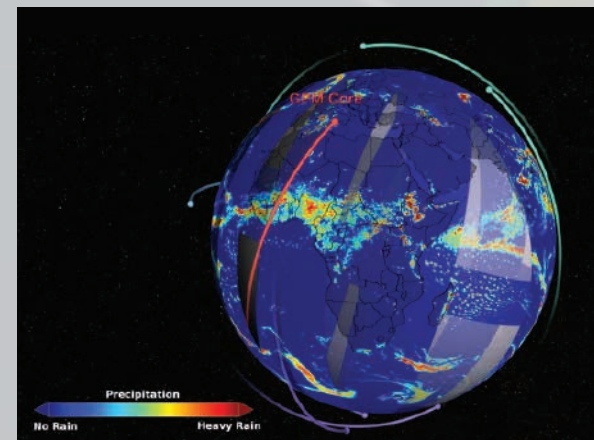
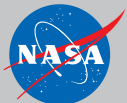
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						Halloween

GPM Dissects 2014 March Snowstorm

The Global Precipitation Measurement (GPM) mission's Core Observatory spacecraft observed a rare late-season snowstorm over the Eastern United States in mid-March 2014, when the jet stream dropped south across a cold high pressure along the Mid-Atlantic coast. The storm that formed deposited more than 7 inches (~18 centimeters) of snow on the nation's capital, with even greater amounts in a swath from the Blue Ridge Mountains to southern New Jersey. GPM, a joint NASA-Japan Aerospace Exploration Agency (JAXA) mission, is the first NASA spacecraft specifically designed to measure falling snow in addition to liquid rain.

This image, from March 17, 2014 (just 18 days after GPM's launch), combines data from GPM's Dual-frequency Precipitation Radar (DPR) and GPM Microwave Imager (GMI) and shows the southern extent of the storm off the coast of South Carolina. Together the DPR and GMI collect observations that allow scientists to dissect clouds. Like a diagnostic CAT scan, the DPR returns the three-dimensional profile that shows the intensities of liquid and solid precipitation. Blue shades indicate frozen precipitation, while red to green shades indicate liquid precipitation. Inside the storm over the Atlantic ocean, precipitation was frozen at high altitudes in the cloud before melting into rain near the surface. Inland, the temperatures were below freezing all the way down to the surface, allowing the formation of shallow, low-level (i.e., nimbostratus) clouds capable of producing snow. The GMI, which senses the total precipitation within all cloud layers including light rain and falling snow, provides the two-dimensional view of the storm's precipitation at the surface—like an X-ray. GMI views an area nearly four times as wide as DPR. The GPM Core Observatory GMI anchors partner satellite data to provide next-generation uniform estimates of precipitation everywhere on the Earth every three hours. To learn more about GPM, visit www.nasa.gov/gpm.

Image and partial text credit: NASA's Scientific Visualization Studio



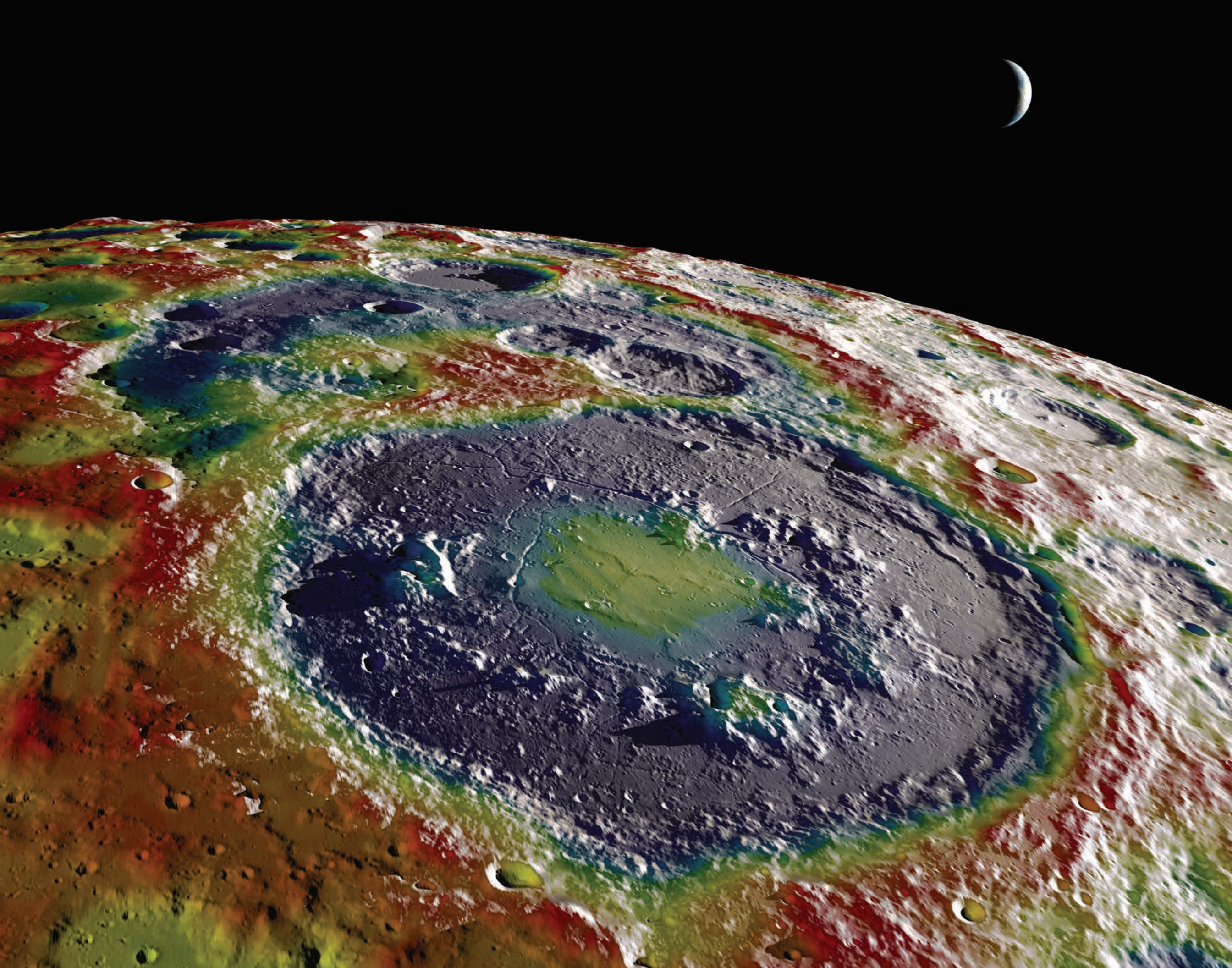
The GPM mission comprises a constellation of U.S. and international space agency spacecraft to provide uniform next-generation estimates of precipitation everywhere on Earth every three hours. Image credit: NASA's Scientific Visualization Studio

September 2015

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November 2015

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Daylight Savings Time Ends	2	3 Election Day	4	5	6	7
8	9	10	11 Veterans Day	12	13	14
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22	23	24	25	26 Thanksgiving Day	27	28
29	30					

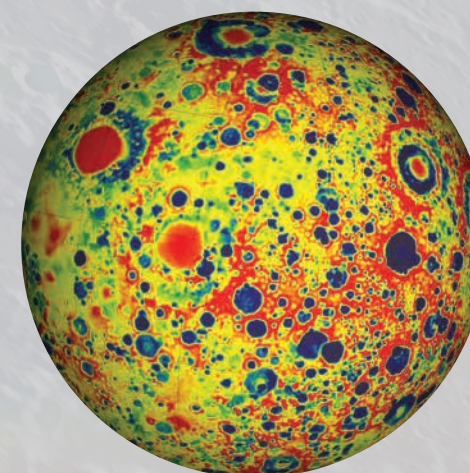
GRAIL Gravity Map of the Moon's Southern Latitudes

If planetary bodies were perfectly smooth and had uniform density, gravity would be uniform over their surfaces. However, real planetary bodies such as Earth and the moon have bumpy surfaces and lumpy interiors and those lumps and bumps cause infinitesimally small changes in gravity as one moves across the surface. While we often ignore such small variations and assume gravity is "constant," for real world applications we must take them into account. NASA has developed instruments that can detect these very small changes in gravity and convert the information into useful scientific information about Earth and the moon.

Take for example this image of the moon from the Gravity Recovery and Interior Laboratory (GRAIL) mission that shows deviations from the mean gravity that a *cueball moon*—a hypothetical smooth, uniformly dense moon—would have. In this view the south pole is near the horizon in the upper left, and reveals the gravity for that region in even finer detail than the global gravity map published in the 2014 NASA Science Calendar and shown in the inset image at right. The terminator—which divides the light and dark sides of the Moon—crosses the eastern rim (i.e., left side) of the Schrödinger basin (*center*). The deviations are measured in *milliGals*—a unit of acceleration. On the map, purple is at the low end of the range and red is at the high end; yellow denotes the mean.

The gravity data are overlaid on a terrain map derived using data from the Lunar Reconnaissance Orbiter's Lunar Orbiter Laser Altimeter (LOLA) and Lunar Reconnaissance Orbiter Camera (LROC). Notice how the gravity variations line up very well with the terrain (such as peaks and craters), as well as the mass concentration lying beneath the Schrödinger basin.

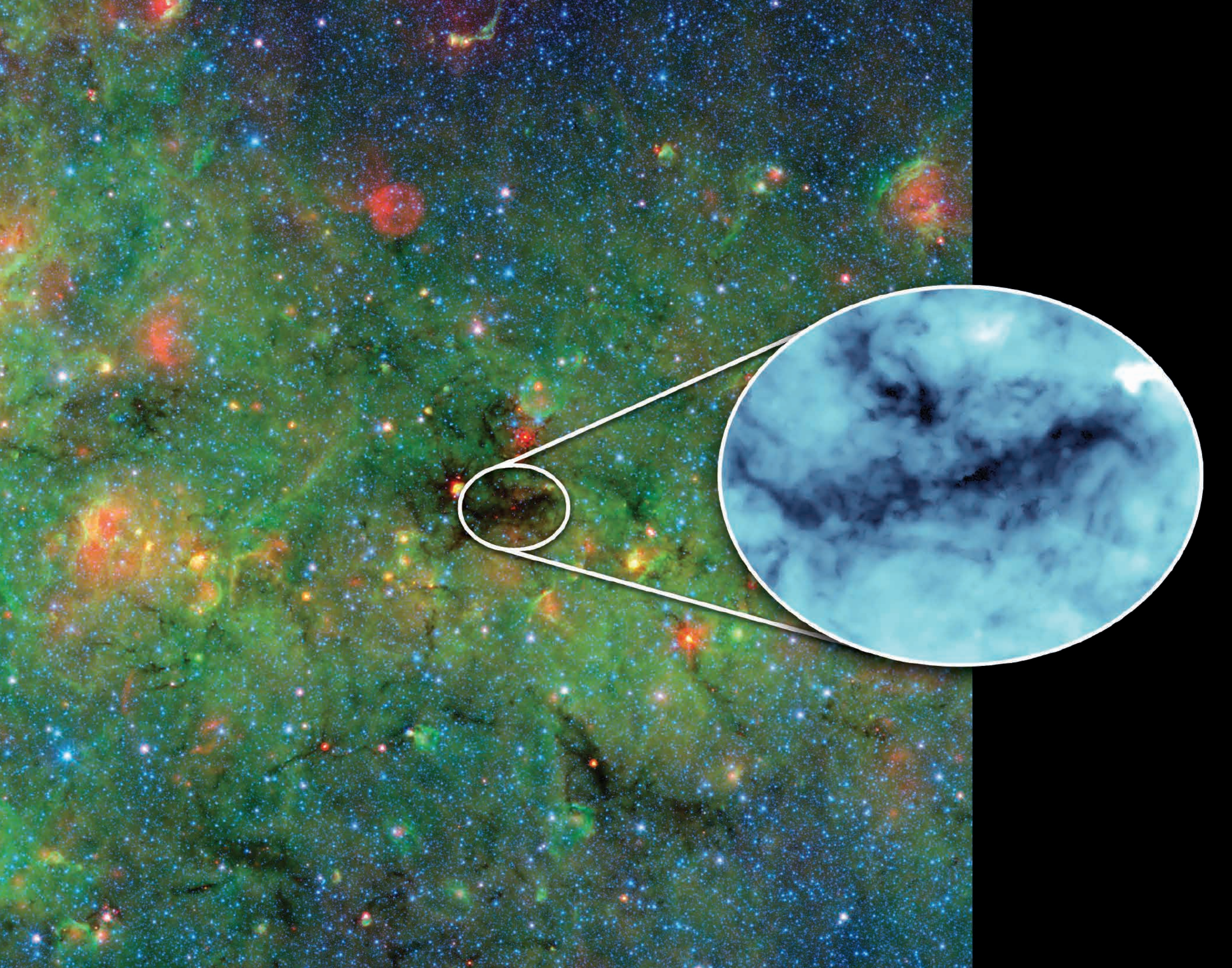
Image and partial text credit: NASA's Scientific Visualization Studio



The twin GRAIL satellites use a precise formation-flying technique to map the moon's gravity field, shown here. Image credit: NASA

October 2015						
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December 2015						
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December 2015



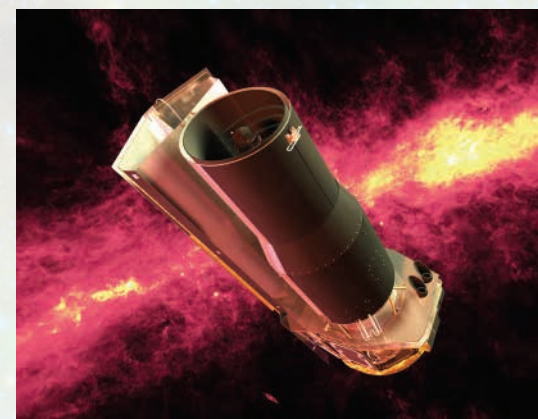
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27	28	29	30	31	Christmas Day	

Mapping the Densest Dusty Cloud Cores

Astronomers have found cosmic clumps so dark, dense, and dusty that they cast the deepest shadows ever recorded. Infrared observations from NASA's Spitzer Space Telescope of these blackest-of-black regions paradoxically light the way to understanding how the brightest stars form. The background image combines data from previous Spitzer surveys of this area. Blue represents 3.6-micron light, while green represents light of 8 microns, both captured by Spitzer's Infrared Array Camera. Red represents 24-micron light detected by Spitzer's Multiband Imaging Photometer. The oval image (blue) shows details of the cloud, calculated using Spitzer's infrared observations at a wavelength of 8 microns.

The dense clumps represent the darkest portions of the cloud located about 16,000 light-years from Earth. A new study takes advantage of the shadows cast by these clumps to measure the cloud's structure and mass. Scientists were able to pin down the cloud's mass to the equivalent of 70,000 Earth suns packed into an area spanning about 50 light-years in diameter. Results suggest that this dusty cloud will likely evolve into one of the most massive young clusters of stars in our galaxy. The densest clumps will blossom into the cluster's biggest, most powerful stars—called O-type stars—the formation of which has long puzzled scientists. These hulking stars have major impacts on their local stellar environments while also helping to create the heavy elements needed for life.

Image and partial text credit: NASA/Jet Propulsion Laboratory (JPL)-California Institute of Technology (Caltech), M. Butler (University of Zurich)



Artist's rendering of the Spitzer Space Telescope. Image credit: NASA/JPL-Caltech

November 2015

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January 2016

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