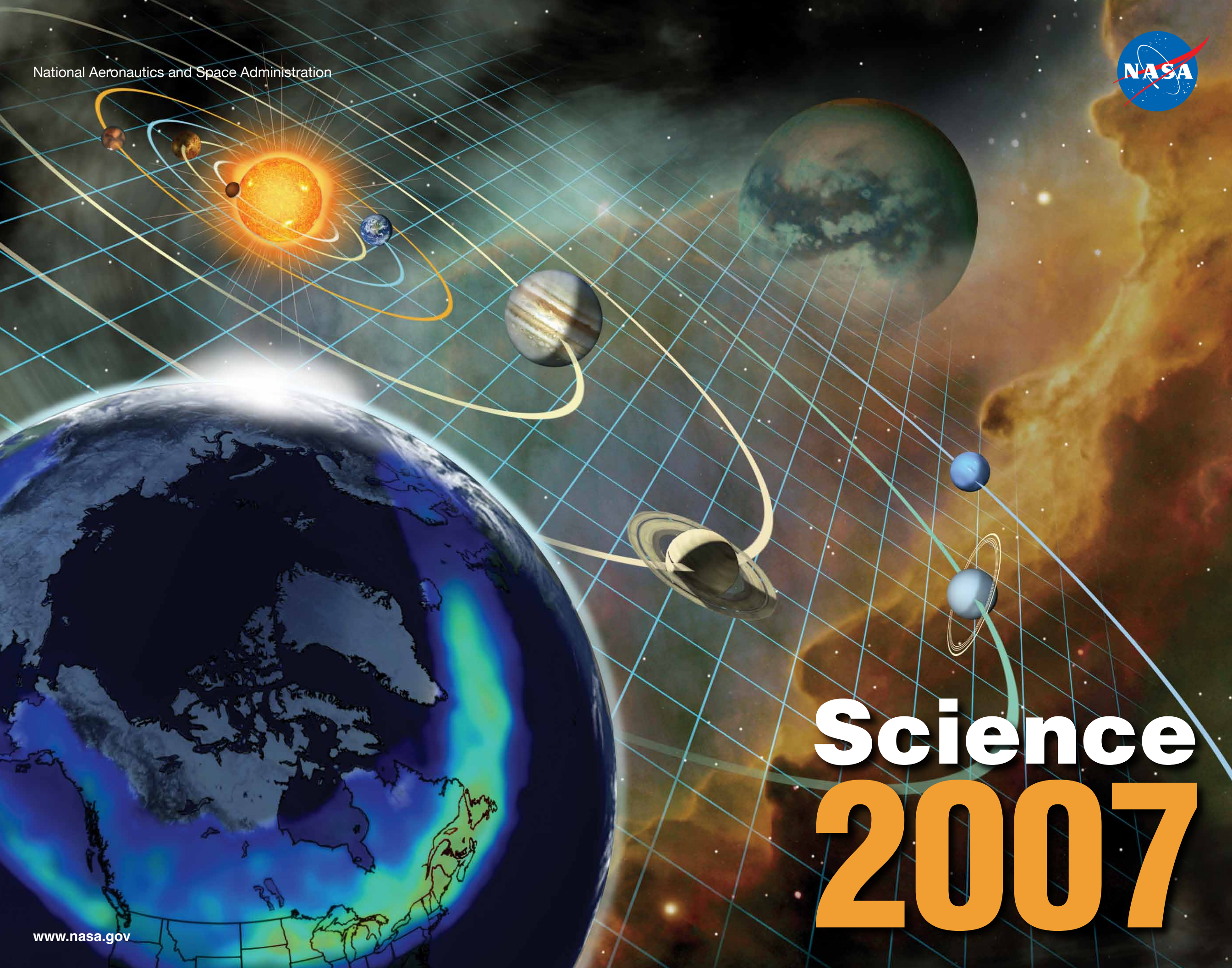



National Aeronautics and Space Administration



Science 2007

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*It is difficult to say what is impossible, for the dream of
yesterday is the hope of today and the reality of tomorrow.*

—Robert H. Goddard



December 2006



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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31 Christmas Day						

Hubble Views the Orion Nebula

Down through the centuries, mankind has been fascinated with studying the stars. NASA's Hubble Space Telescope will celebrate its seventeenth year of operations in 2007. From the beginning, Hubble has revealed the stunning natural beauty of our universe, but there is also *science behind the scenery*. As scientists study the images returned from Hubble and other current and future space telescopes, they will learn more about the very nature of the universe. Hubble has helped us determine the age of the universe and the way galaxies form, and has revealed extraordinary details about the process by which Sun-like stars end their lives as planetary nebulae.

Close inspection of this 2006 Hubble Space Telescope color mosaic of the Orion Nebula (M42) reveals numerous treasures that reside within the nearby, intense star-forming region. Southwest of the Trapezium stars located in the center of the nebula, a stunning Hubble Heritage *portrait* reveals intricate details about the nebula. Deeply contrasting areas of light and dark blend with a palette of colors to form rich swirls and fluid motions that would make even the best artists stand back and admire their work.

Image Credit: NASA/European Space Agency/Hubble Heritage Team/Space Telescope Science Institute/Association of Universities for Research in Astronomy, Inc.

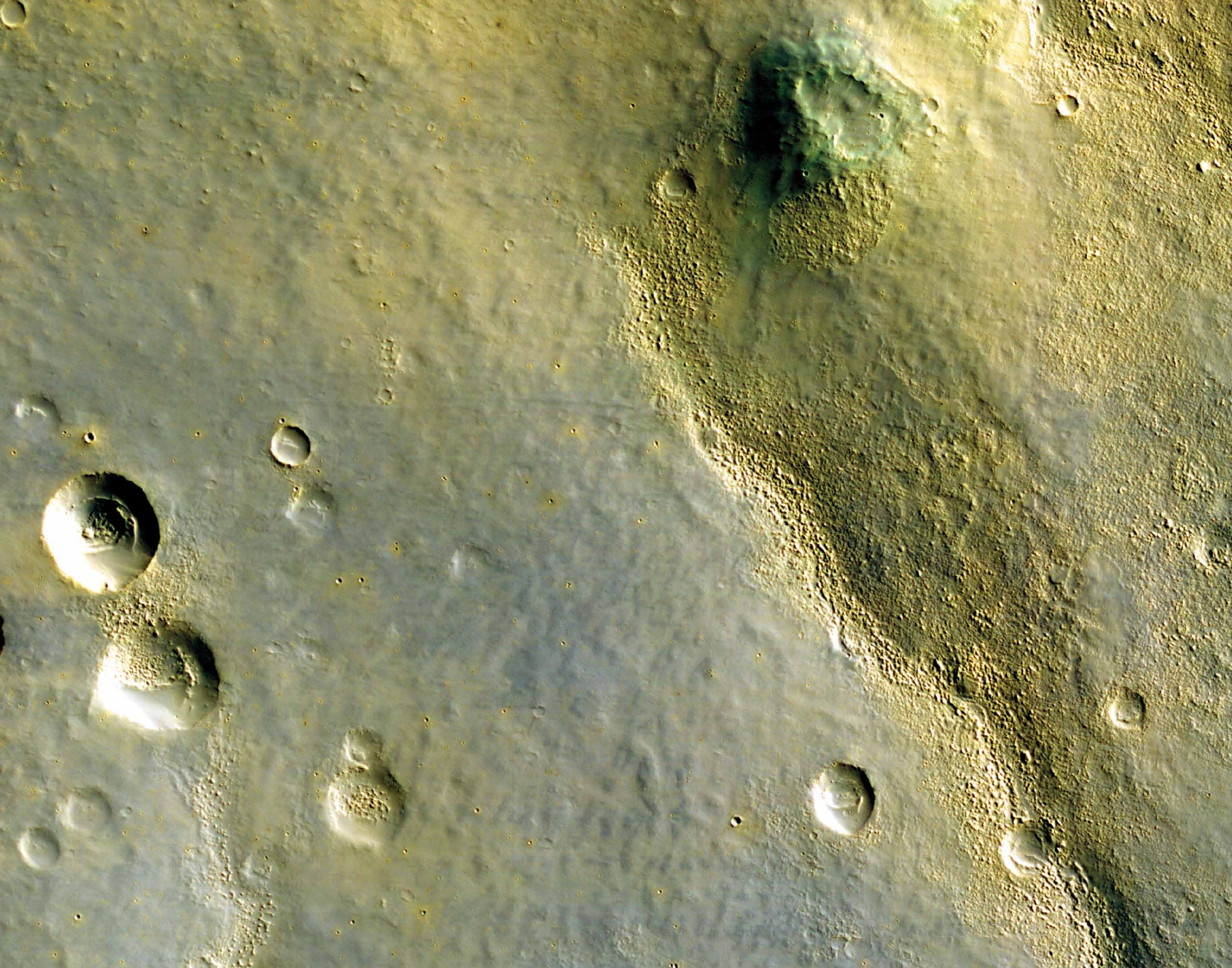


The Space Shuttle views Hubble from above.

NOVEMBER 2006						
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JANUARY 2007						
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January 2007



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3	4	5	6
	New Year's Day					
7	8	9	10	11	12	13
						
14	15	16	17	18	19	20
	Martin Luther King, Jr. Day					
21	22	23	24	25	26	27
						
28	29	30	31			

Mars Reconnaissance Orbiter (MRO) Probes the Martian Surface

For centuries, human beings have looked to the skies and wondered about the composition of the surface and atmosphere of Mars; many a speculative science fiction tale has been written about Mars. Now, courtesy of a series of current and planned NASA missions, we are finding out the scientific facts about the makeup of the "Red Planet." These unmanned missions are seen as the first step toward one day sending humans to explore Mars.

The image shown above is the first color image of Mars from the High Resolution Imaging Science Experiment (HiRISE) on NASA's MRO obtained March 24, 2006. This is not natural color as seen by human eyes, but is colored from infrared data, at longer wavelengths. This image also has been processed to enhance subtle color variations. The southern half of the scene is brighter and bluer than the northern half, perhaps due to early-morning fog in the atmosphere. Large-scale streaks in the northern half are due to the action of wind on surface materials. The blankets of material ejected from the many small fresh craters are generally brighter than the surrounding surface, although a few are darker. Two greenish spots in the middle right of the scene may have an unusual composition, and are good future targets for the Compact Reconnaissance Imaging Spectrometer for Mars, a mineral-identifying instrument on MRO. In the bottom half of the image we see a golden color in the rough areas, where wind and sublimation of water or carbon dioxide ice have partially eroded patches of smooth-textured deposits.

Image Credit: NASA/Jet Propulsion Laboratory/University of Arizona.



DECEMBER 2006						
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FEBRUARY 2007						
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February 2007



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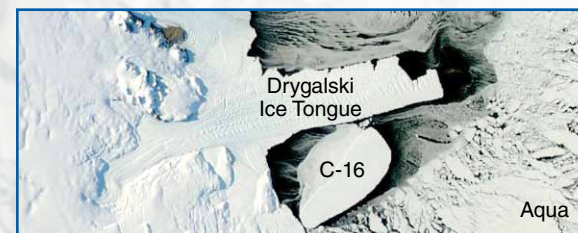
Iceberg!... Aqua and Terra View Sea Ice Collision in the Antarctic

One advantage of NASA's Earth observing satellite observations is that they can be used to monitor the conditions in remote locations with harsh climates where ground observations are difficult if not impossible—such as in Antarctica. Large ice shelves such as the Ross Ice Shelf on the western Antarctica coastline undergo periodic episodes of large-scale iceberg calving. In 2000, several large pieces of the shelf broke off and wandered around in the Ross Sea, breaking into several smaller bergs over the next few years. Among the survivors of the initial calving event is piece C-16. In late March 2006, C-16 worked its way northward along the coastline and plowed into the tip of the Drygalski Ice Tongue. The collision knocked loose a chunk from the tip of the ice tongue.

The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite obtained an image of C-16 on March 31, 2006, around the time of the collision. By this time, C-16 had clipped the tip of the ice tongue, breaking off a piece.

Shown in the inset right for comparison are images that MODIS on NASA's Aqua and Terra satellites, obtained before and after the collision. On March 26, C-16 is situated just south of the ice tongue, held back from colliding with it by a small wedge of sea ice. By April 3, C-16 and the broken piece had swung around to the northern side of the ice tongue.

Image Credit: MODIS Rapid Response Team, NASA/Goddard Space Flight Center.



March 26, 2006



April 3, 2006

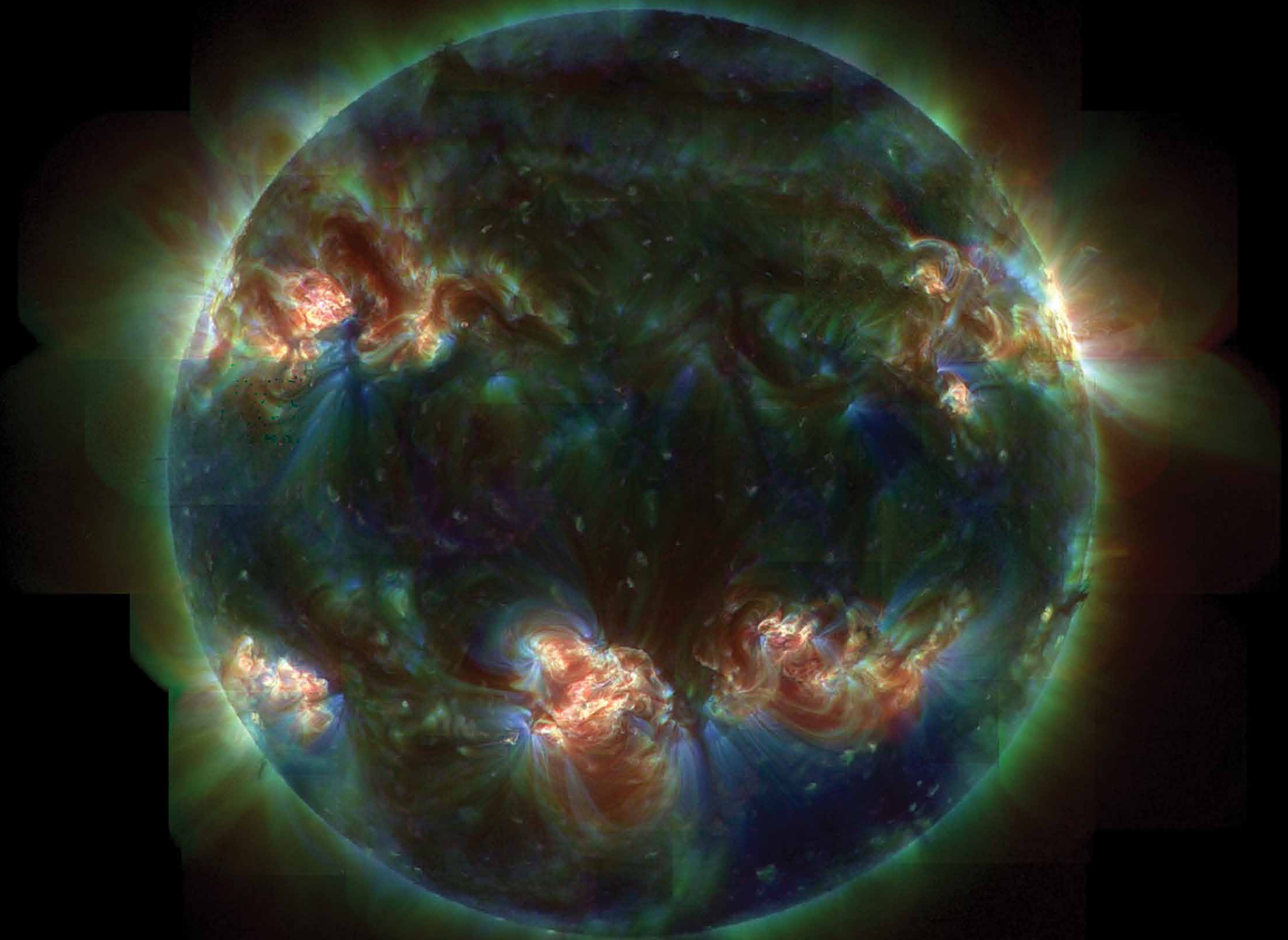
JANUARY 2007

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MARCH 2007

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March 2007



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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Daylight Savings Time Begins						
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Who Turned Off the Sun? TRACE Views a Dark Sun

NASA satellites help us study the Sun and the surrounding solar atmosphere called the *heliosphere*. Our Sun is a sizzling ball of seething hot gas. Unpredictably, regions of strong and tangled magnetic fields arise, causing sunspots and bright active regions. The Sun's surface bubbles as hot hydrogen gas streams along looping magnetic fields. These active regions channel gas along magnetic loops, usually falling back but sometimes escaping into the solar corona or out into space as the solar wind.

Pictured above is an image obtained by the Transition Region and Coronal Explorer (TRACE), a NASA Small Explorer (SMEX) mission to image the solar corona and transition region. The image shows a composite of three different wavelengths of ultraviolet light. When viewed in ultraviolet light, we see the Sun in a whole new light—or rather, a lack thereof. Since only active regions of the Sun emit significant amounts of energetic ultraviolet light, most of the Sun appears dark. The colorful portions glow spectacularly, however, pinpointing the Sun's hottest and most violent regions. Although the Sun is constantly changing, the rate of visible light it emits has been relatively stable over the past five billion years, helping life to thrive on Earth.

Image Credit: NASA's TRACE Project/Stanford-Lockheed Institute for Space Research.



Artist's rendering of the TRACE Spacecraft.

FEBRUARY 2007

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APRIL 2007

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SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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Three NASA Great Observatories Join Forces to View the M-82 Galaxy

Many times, NASA missions combine their observational capabilities to maximize scientific value of the results returned. The combined resources of NASA's Spitzer, Hubble, and Chandra space observatories were brought together to create this multi-wavelength, false-colored view of the M-82 galaxy. The lively portrait shown above views M-82 in its "full wavelength" glory, and was done to commemorate Hubble's "sweet sixteen" birthday in 2006.

X-ray data recorded by Chandra appears in blue; infrared light recorded by Spitzer appears in red; Hubble's observations of hydrogen emission appear in orange, and the bluest visible light appears in yellow-green.

Image Credit: NASA/Jet Propulsion Laboratory-Caltech/Space Telescope Science Institute/Chandra X-ray Center/University of Arizona/European Space Agency/Association of Universities for Research in Astronomy, Inc./Johns Hopkins University.



This observation of the magnificent starburst galaxy, Messier 82 (M82) was made in March 2006, with Hubble's Advanced Camera for Surveys' Wide-Field Channel. Image Credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA).

MARCH 2007						
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MAY 2007						
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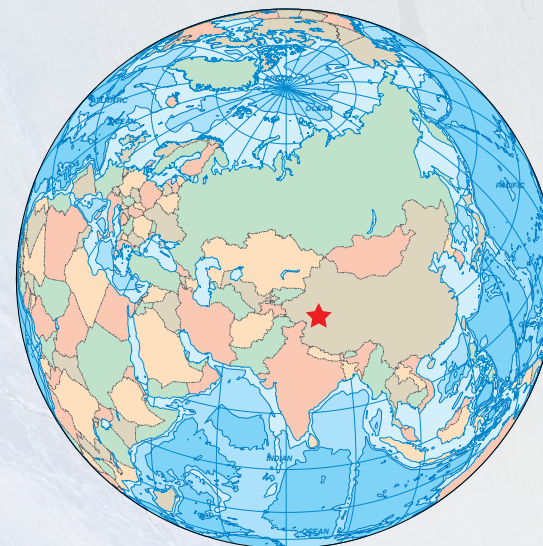
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Memorial Day						

Satellites Study Geology: Terra Views an Alluvial Fan in China

NASA Earth observing satellites provide a new perspective for observing geological features. When mountains shed sediment off their flanks, streams carry it away as alluvium. When a mountain stream flows through a narrow canyon, the water flows rapidly, has lots of energy, and picks up lots of alluvial sediment along the way. Later, when the stream flows out into a wider area and disperses, the waters slow down, loses much of its energy, and drops most of the sediment. Over thousands of years, a wide cone-shaped pile of sediment builds up—called an *alluvial fan*.

On May 2, 2002, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite acquired this image of a vast alluvial fan that blossoms across the desolate landscape between the Kunlun and Altun Mountains that form the southern border of the Taklimakan Desert in China's XinJiang Province. The river appears electric blue as it runs out of the mountains at the bottom right corner of the scene and then fans out into scores of intricate, braided channels that disappear into the desert. Dry channels—perhaps the river's former paths—appear as silvery etchings at lower right.

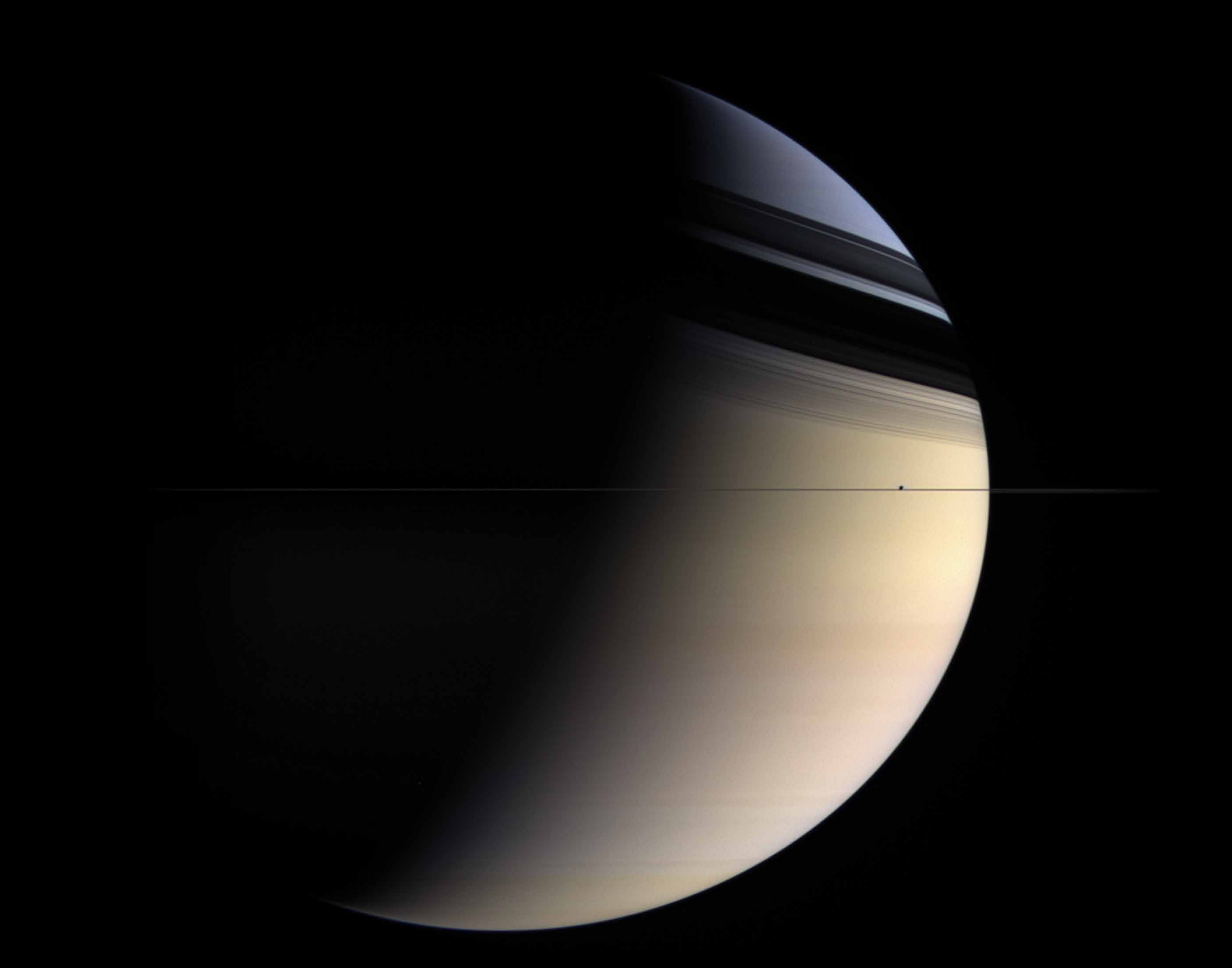
Image Credit: NASA/Goddard Space Flight Center/METI/Earth Remote Sensing Data Analysis Center/Japan Resources Observation System Organization, and U.S./Japan ASTER Science Team.



APRIL 2007						
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JUNE 2007						
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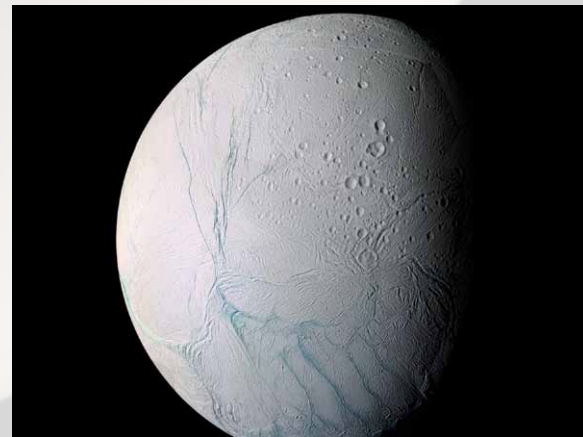
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Cassini Views Saturn's Surface As If Through Human Eyes

NASA sends probes to study the other planets in the solar system and, in so doing, we learn much about the makeup of our planetary neighbors. The image above is a composite of images taken with the Cassini spacecraft's wide-angle camera on March 16, 2006—using red, green, and blue spectral filters—to create a picture that approximates what the human eye would see if it looked at Saturn's surface from orbit. Dreamy colors ranging from pale rose to butterscotch to sapphire give this utterly inhospitable gas giant a romantic appeal. Shadows of the rings caress the northern latitudes, whose blue color is presumed to be a seasonal effect. The tiny dot visible above the ringplane is Saturn's moon Enceladus.

Image Credit: NASA/Jet Propulsion Laboratory/Space Science Institute.

The small image shows the surface of Saturn's moon Enceladus, whose ongoing geologic activity tells a fascinating story of the ancient and present struggles of one tiny moon. Ancient craters remain somewhat pristine in some locales, but not in others. Northward-trending fractures, likely caused by a change in the moon's rate of rotation and the consequent flattening of the moon's shape, rip across the southern hemisphere. The south polar terrain is marked by a striking set of 'blue' fractures and encircled by a conspicuous and continuous chain of folds and ridges, testament to the forces within Enceladus that have yet to be silenced. Image Credit: NASA/JPL/Space Science Institute.



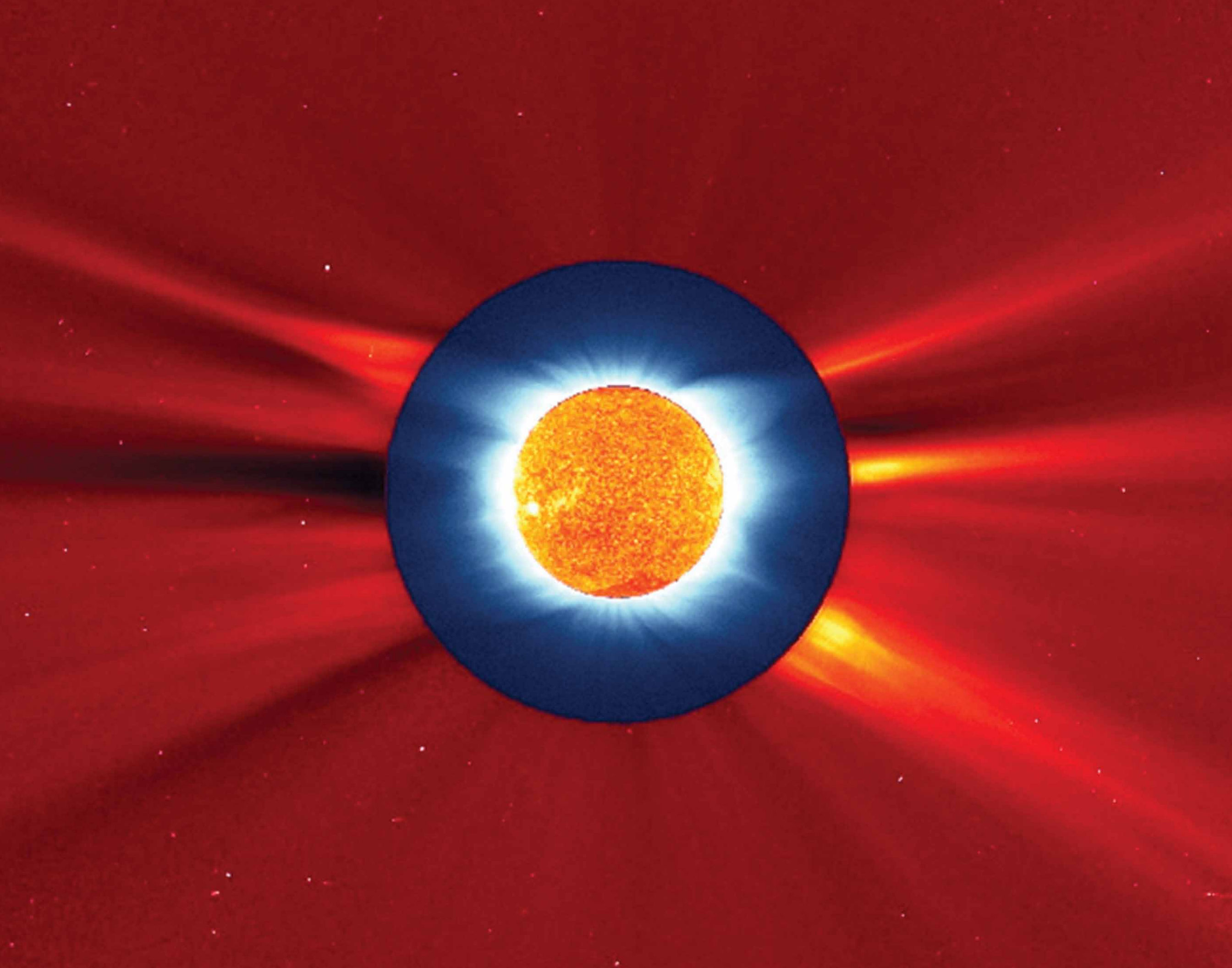
MAY 2007

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JULY 2007

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SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3	4 Independence Day	5	6	7
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A Rare Glimpse of the Sun's Corona From Earth

The Sun's outer atmosphere is called the *corona*. From its position in space 1.5 million miles sunward of planet Earth, the Solar and Heliospheric Observatory (SOHO) routinely observes the corona. Only during a total solar eclipse, however, when the moon briefly blocks the overwhelmingly bright solar surface, can Earth-based observers catch a glimpse of the lovely coronal streamers and structures.

On March 29, 2006, the Moon's shadow swept over the Earth during the fourth total solar eclipse of this century. In this composite image, SOHO's uninterrupted view of the solar corona above the solar photosphere (center) and corona far beyond the Sun's disk, are shown in orange hues. The middle, donut-shaped region is the corona as recorded by the Williams College Eclipse Expedition to Kastelorizo Island, Greece during the total solar eclipse. Merging ground and space-based views allow astronomers to trace features in the corona that reach from just above the Sun's surface into the solar wind, sometimes impacting the Earth's upper atmosphere.

Credit: Williams College Eclipse Expedition/National Science Foundation/NASA/National Geographic.

The International Space Station orbits Earth 230 miles above the surface and was in position during the eclipse to view the *umbral* (ground) shadow cast by the Moon as it moved between the Sun and the Earth. The terminator of the eclipse—the line between the light and dark parts of the Sun's disk—is visible as it passes across central Turkey. The portion of the ISS visible at the top of the image is the Space Station Remote Manipulator System. Image Credit: Image Science and Analysis Laboratory, NASA-Johnson Space Center.

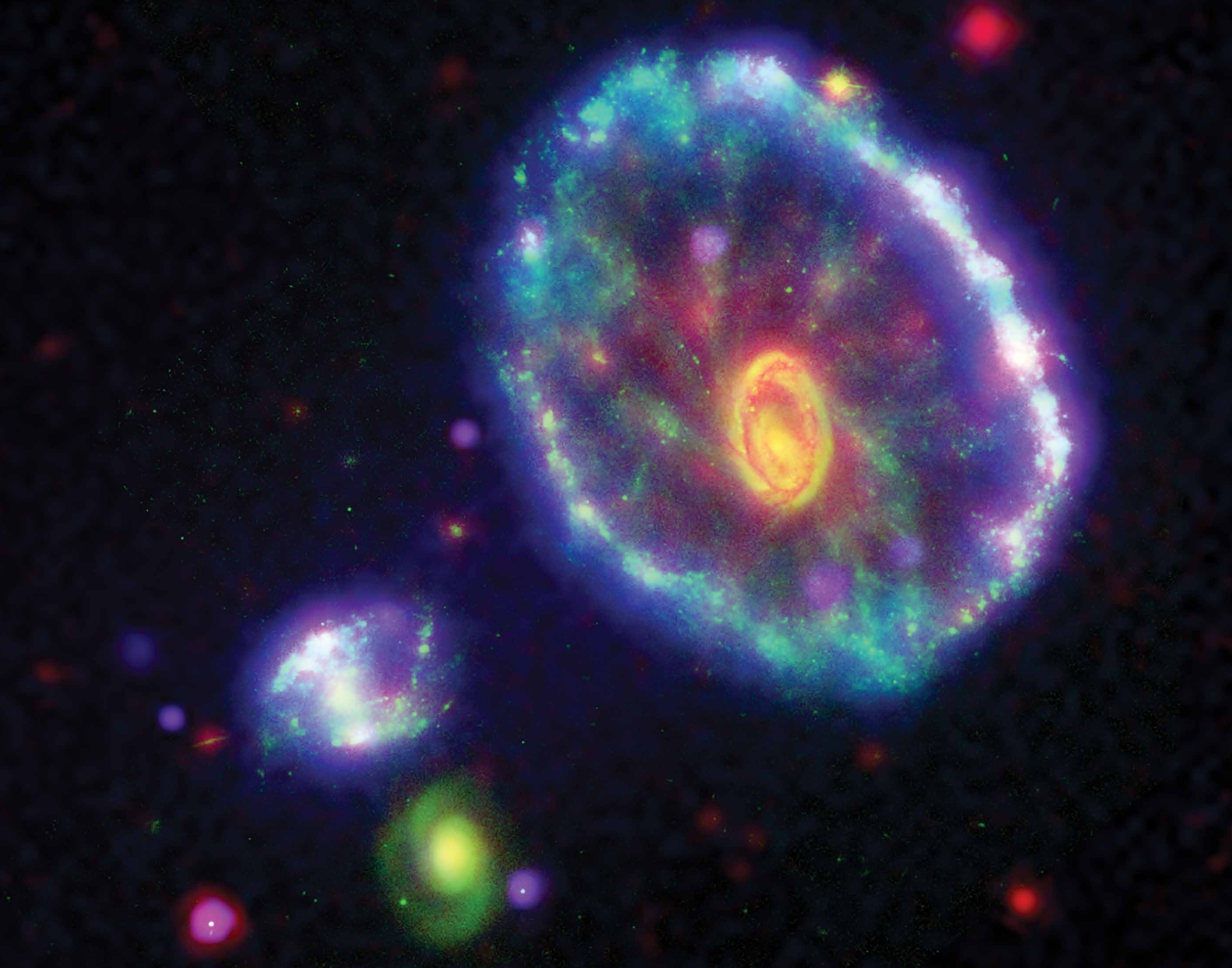


JUNE 2007

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AUGUST 2007

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August 2007



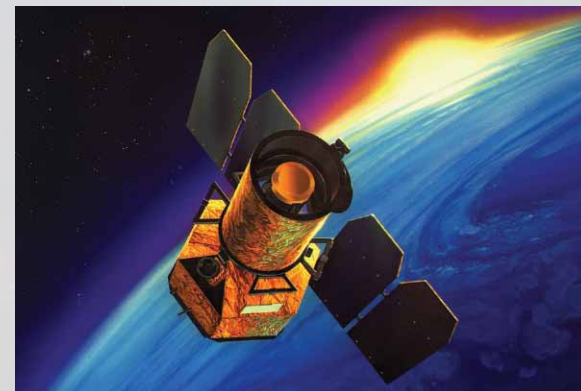
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NASA Paints a Neon-Colored Portrait of the Cartwheel Galaxy

Somewhere in the vast reaches of interstellar space lies a massive galaxy 2.5 times larger than our Milky Way with a “hole in its heart.” It is a galaxy in chaos, as a smaller galaxy has plunged through the middle of it triggering ripples of sudden, brief star formation.

Four different NASA missions have combined forces to create this multi-wavelength, neon-colored portrait of the Cartwheel Galaxy. This false-color composite image shows the Cartwheel Galaxy as seen by Galaxy Evolution Explorer in ultraviolet light (blue); the Hubble Space Telescope in visible light (green); the Spitzer Space Telescope in infrared (red); and the Chandra X-Ray Observatory (purple). The dramatic collision with the other galaxy has left the Cartwheel Galaxy with a crisp, bright ring around a zone of relative calm. A more typical galaxy (like our Milky Way) would be brighter toward the middle, but the ultraviolet view indicates the collision actually smoothed out the interior of the galaxy, concentrating older stars and dust into the inner regions. The outer ring, itself bigger than the entire Milky Way galaxy, appears blue and violet in the image. The yellow-orange inner ring and nucleus at the center of the galaxy result from the combination of visible and infrared light, which is stronger towards the center. This region of the galaxy represents the second ripple, or ring wave, created in the collision, but has much less star formation activity than the first (outer) ring wave. The wisps of red spread throughout the interior of the galaxy are organic molecules that have been illuminated by nearby low-level star formation. Meanwhile, the tints of green are less massive, older, visible light stars.

Image credit: NASA/Jet Propulsion Laboratory-Caltech/Spitzer Science Center.



Artist's rendering of the GALEX Evolution Explorer.

JULY 2007						
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SEPTEMBER 2007						
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September 2007



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9	Labor Day	11	12	13	14	15
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Aqua Observes Southern California's Day Fire

NASA's Earth observing satellites provide eyes in the sky that can help decision makers and emergency workers plan their response to natural disasters—such as forest fires. Smoke sometimes obscures the view from aircraft used to track the progress of fires, but satellites positioned 705 kilometers away in space are not adversely impacted by smoke on the ground and can help firefighters determine the fire's intensity, how fast the fire is spreading, and what direction it is moving. The data are useful long after the fire is put out. Resource managers can use the information to help them plan for the rehabilitation of the burned area and protect the water quality in the area impacted. Scientists can use fire information as well, to study the impact of the fire on local ecosystems and to estimate the amount of carbon dioxide and other greenhouse gases released. The released gases impact atmospheric composition and can also impact regional and, in some cases, even global climate.

The image shown above shows the "Day Fire"—so named because it started on Labor Day 2006—burning northwest of Los Angeles. The fire was churning out a thick, snake-like plume of smoke, when the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite passed overhead and captured this image on September 17, 2006. Places where the sensor detected actively burning fire are outlined in red. The smoke blankets several of the Channel Islands, leaving Santa Rosa partially visible. The fire covered approximately 60,589 acres and was only about 15% contained when this image was obtained.

Image Credit: MODIS Rapid Response Team, NASA/Goddard Space Flight Center.



AUGUST 2007						
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OCTOBER 2007						
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October 2007



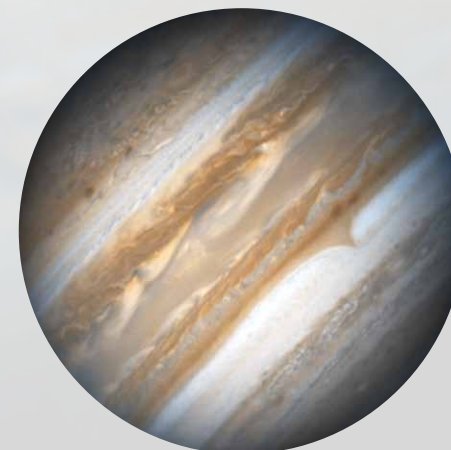
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Hubble Seeing Spots ... on Jupiter

The Hubble Space Telescope not only gives us beautiful images of galaxies far, far away, but it also gives us unprecedented views of the planets in our own stellar neighborhood—the Solar System.

This image of Jupiter from Hubble gives us the most detailed view to date of a second red spot emerging on Jupiter. For the first time in history, astronomers have witnessed the birth of a new red spot on the giant planet, which is located half a billion miles away. The storm is roughly one-half the diameter of its bigger and legendary cousin, the Great Red Spot. Researchers suggest that the new spot may be related to a possible major climate change in Jupiter's atmosphere. These images were taken with Hubble's Advanced Camera for Surveys on April 8 and 16, 2006.

Image Credit: NASA/Goddard Space Flight Center/Jet Propulsion Laboratory/European Space Agency/University of Basque Country, Esteve Duran Observatory Foundation, Spain.



This full disk image of Jupiter was taken with Hubble's Wide Field Planetary Camera 2 on February 17, 2007, using the planetary camera detector.

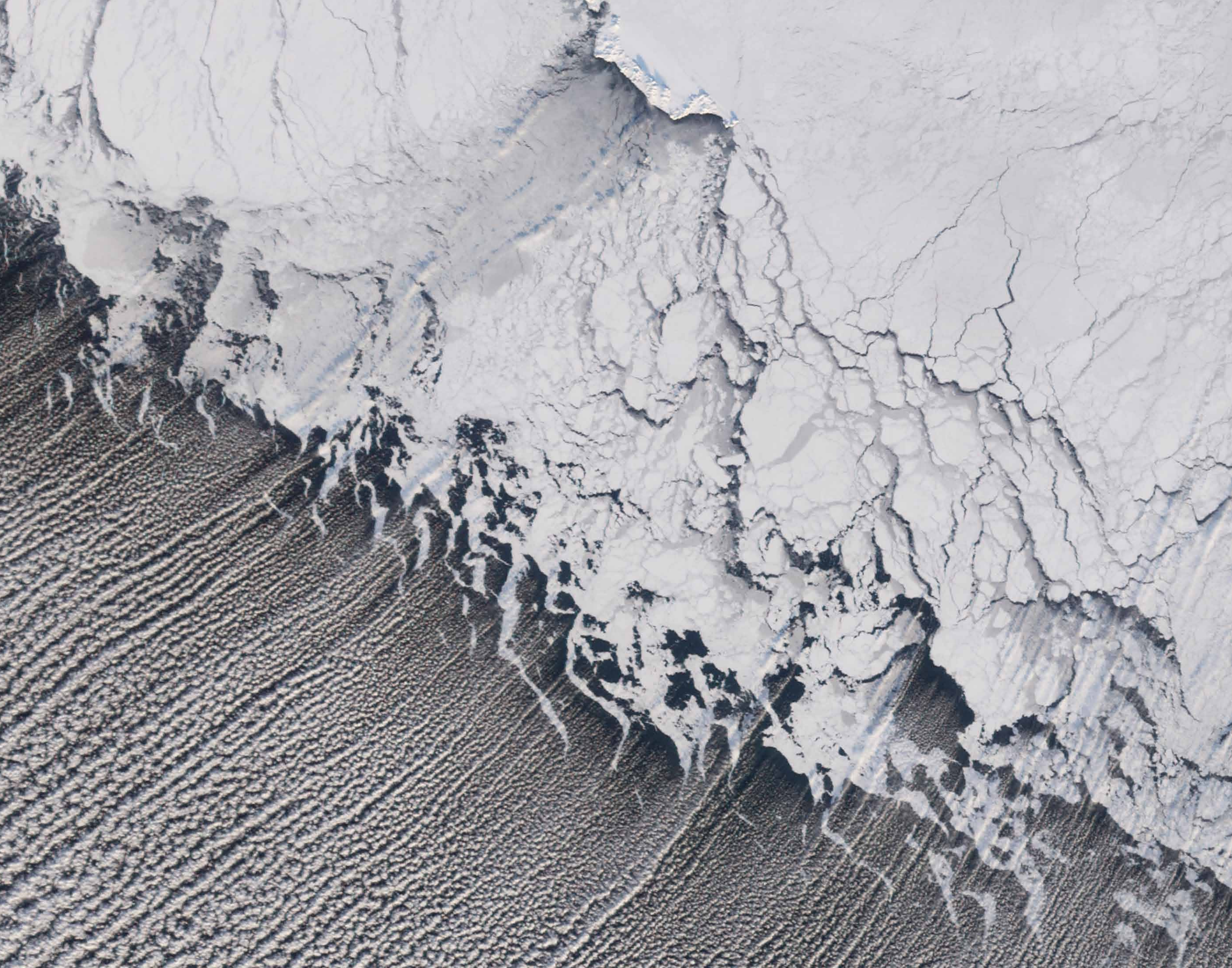
SEPTEMBER 2007

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NOVEMBER 2007

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November 2007



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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Daylight Saving Time Ends						
11	12	13	14	15	16	17
Veterans Day						
18	19	20	21	22	23	24
				Thanksgiving Day		
25	26	27	28	29	30	

Terra Views Cloud Streets in the Bering Sea

One of the most interesting features of Earth, as seen from space, is the ever-changing distribution of clouds. As they float above us, we hardly give their presence a second thought. And yet, clouds have an enormous influence on Earth's energy balance, climate, and weather. People have been observing and keeping records of clouds for generations. These ground-based records have made important contributions to our current understanding of clouds, but scientists need a detailed global cloud database to continue to improve model representations of clouds. Observations from NASA's Earth observing satellites complement and extend the ground-based observations by providing increased spatial coverage and multiple observational capabilities.

On January 20, 2006, the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite captured this image of ice and clouds in and above the Bering Sea. Located in the Bering Sea between Alaska and Russia, St. Matthew Island is one of the most remote locations in Alaska. At the top center of the image above, the jagged edge of the island appears to be holding back a wall of sea ice, which is packed tightly against its northern shore. Mountains cast their shadows onto the white surface below, as rows of clouds stream over the Bering Sea from the edge of the sea ice. Called cloud streets, these cumulus clouds form when cold air from the ice blows over the open ocean, chilling the moist air. Billions of tiny droplets of water begin to condense and come together to form clouds, which are arranged in neat rows in line with the powerful sweep of the wind.

Image Credit: Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on NASA's Terra satellite.



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DECEMBER 2007						
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December 2007



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Spitzer Witnesses the Birth of Stars

The Spitzer Space Telescope is the largest infrared telescope ever launched into space. Its highly sensitive instruments give us a unique view of the Universe, and allow us to peer into regions of space that are hidden from optical telescopes. Earth's atmosphere prevents ground-based telescopes from being able to observe outer space in these wavelengths. Many areas of space are filled with vast, dense clouds of gas and dust that block our view when using visible light. Infrared light, however, can penetrate these clouds, allowing us to peer into regions of star formation, the centers of galaxies, and into newly forming planetary systems. Infrared light is useful for observing the *cooler* objects in space, such as smaller stars which are too dim to be detected by their visible light, extrasolar planets, and giant molecular clouds. Also, many molecules in space, including organic molecules, have their unique signatures in the infrared.

The image above showcases Spitzer's observational capabilities. NGC 1333 is a reflection nebula that is located 1000 light years from Earth in the constellation Perseus. Spitzer gives us a glimpse into the beautiful chaos of a dense group of stars being born. The knotty yellow-green features located in the lower portion of the image are glowing shock fronts where jets of material, spewed from extremely young embryonic stars, are plowing into the cold, dense gas nearby. The sheer number of separate jets that appear in this region is unprecedented. This leads scientists to believe that by stirring up the cold gas, the jets may contribute to the eventual dispersal of the gas cloud, preventing more stars from forming in NGC 1333. In contrast, the upper portion of the image is dominated by the infrared light from warm dust, shown as red.

Image Credit: NASA/Jet Propulsion Laboratory-Caltech/Harvard-Smithsonian Center for Astrophysics.



Spitzer rendered against an infrared (100 micrometer) sky.

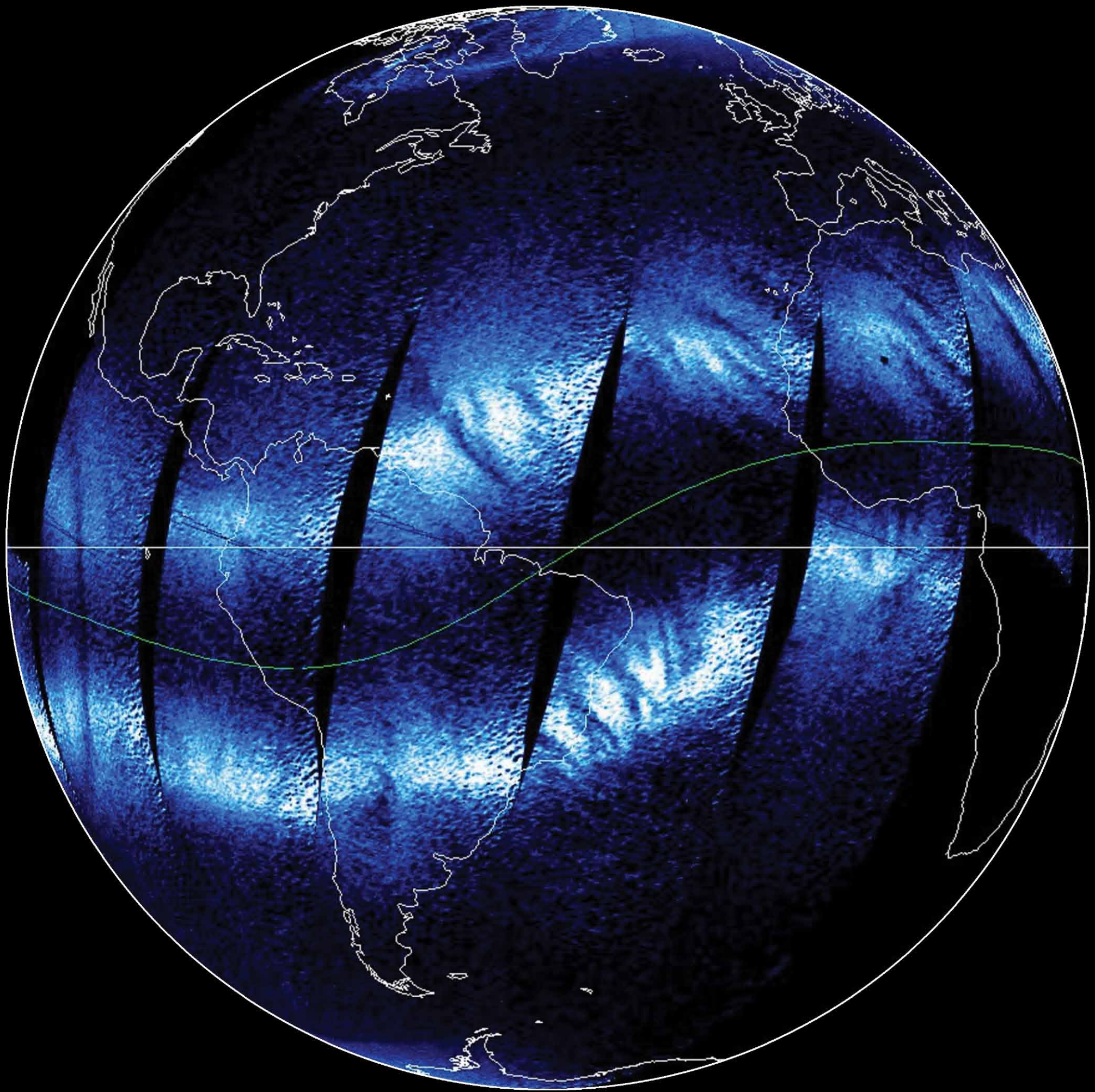
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JANUARY 2008

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January 2008



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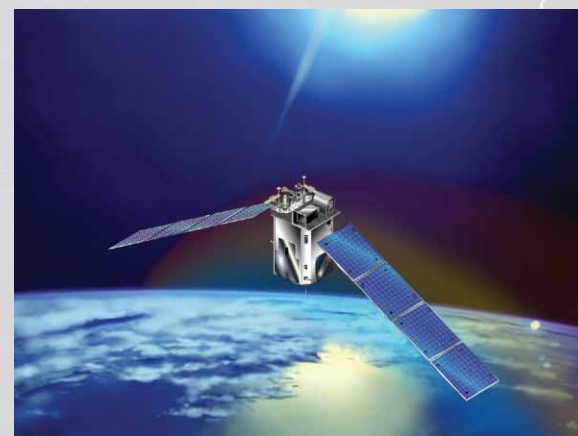
TIMED Views Plasma Bands High Above the Earth

Our ancestors realized that their lives depended upon the Sun and held it in reverent awe. The Sun is vital to sustaining life on Earth and still has the capacity to inspire awe. NASA studies the *heliosphere*—the Sun and the surrounding bubble in space that falls under the influence of the solar wind—to seek to understand how it works, why it changes, and how these changes influence us here on planet Earth.

Encircling the Earth on either side of the equator—green line above—are two bands of super-hot gas called plasma. These high-density regions are located in the ionosphere about 250 miles above the Earth's surface and are influenced by the solar wind. Recent research shows that upwelling hot air from the Earth's surface can also cause slight variations in the plasma bands, and indicates a surprising link between weather on Earth and weather in space. Fluctuations in the strength of these bands can affect radio signals from satellites, including the Global Positioning Satellite (GPS) system.

The Global UltraViolet Imager (GUVI) instrument on the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) spacecraft obtained the false-color image of the plasma bands shown above. Bright, blue-white areas are where the plasma is densest.

Image credit: NASA's TIMED Satellite Mission.



Artist's rendering of the TIMED spacecraft.

DECEMBER 2007

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