

heliophysics

astrophysics

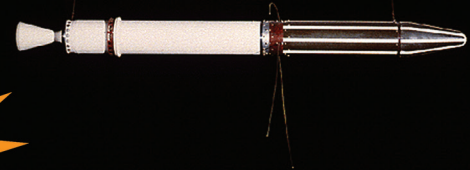
planetary

earth

NASA's
50th
2008

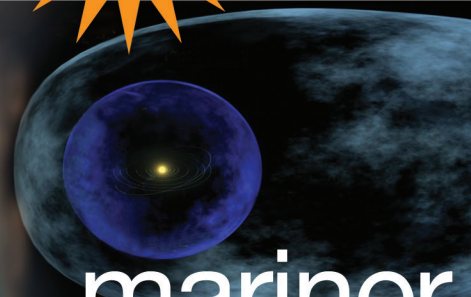
THEN

explorer



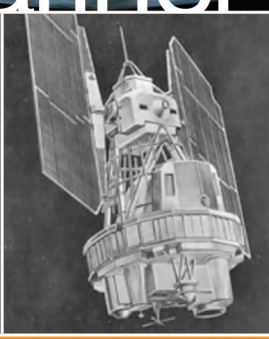
1958

mariner



1962

landsat



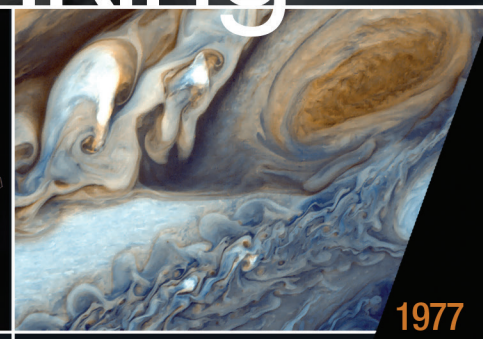
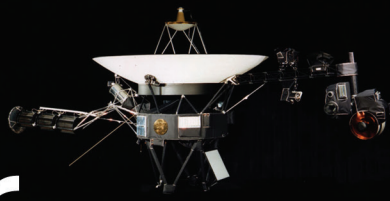
1972



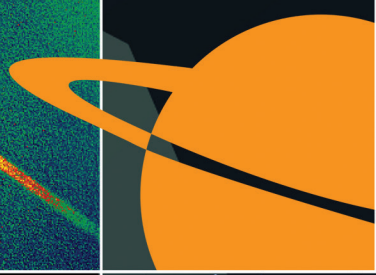
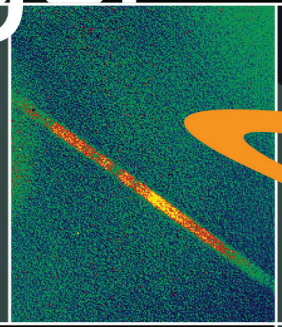
viking

1975

voyager

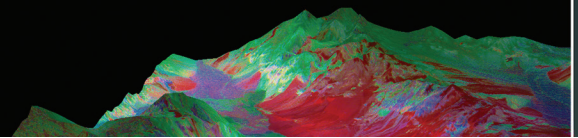


1977



IUE

1978



50 years of science



terra



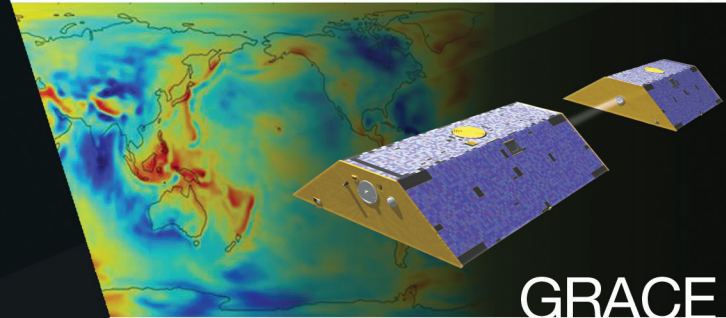
1999



chandra



1999



GRACE

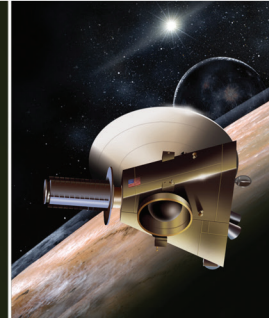
2002



mars rover

2004

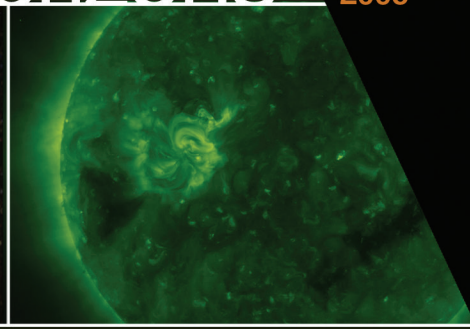
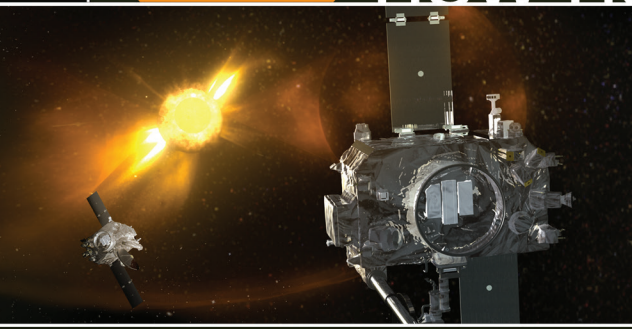
& NOW



new horizons

2006

STEREO



2006

2008





January 2008



| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|--------|--------|---------------------|-----------|----------|--------|----------|
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McMurdo Station: Gateway to the South Pole

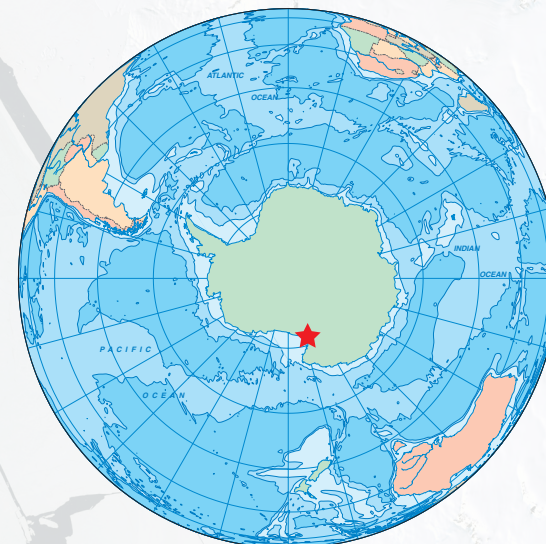
Satellites are revealing the mysteries of the land at the southernmost realms of the Earth—Antarctica. Antarctica exists as an unapproachable giant ice-box to most people, yet what is happening in Antarctica affects us all. The first International Polar Year (IPY) was in 1882 – 1883 and was the first of many concerted international efforts to broaden our understanding of the Polar Regions through interdisciplinary research. The fourth IPY began in March 2007 and extends through March 2009, covering just over two years. This will provide two full seasonal cycles in both the Arctic and the Antarctic. Thousands of scientists from over 60 nations are involved, with over 200 research and educational projects.

This image, acquired on December 27, 2001, by the Enhanced Thematic Mapper Plus (ETM+) on Landsat 7, displays a portion of a natural-color mosaic in the vicinity of McMurdo Station, the largest research base in Antarctica and Antarctica's largest community. McMurdo is the main air gateway to Antarctica, and most scientists and others who go to Antarctica as part of the U.S. Antarctic Program spend at least some time at McMurdo on their way to and from the South Pole Station or research camps.

In support of IPY, the new Landsat Image Mosaic of Antarctica (LIMA) brings the coldest place on Earth alive with a comprehensive view of Antarctica. The image shown here is just one of over 1000 scenes and represents one of the largest mosaics of Landsat data ever created. These data will be hosted free to the public through a user portal that is currently under development.

Image and partial text credit: NASA/U.S. Geological Survey/British Antarctic Survey/National Science Foundation.

eos.nasa.gov



DECEMBER 2007

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FEBRUARY 2008

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February 2008



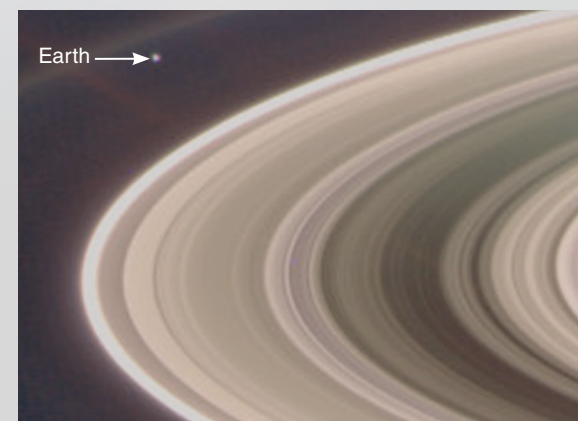
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
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| | | | Ash Wednesday | Chinese New Year | | |
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| | | | | Valentine's Day | | |
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| | Presidents' day | | | | | |
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In Saturn's Shadow

NASA probes explore the other planets of our Solar System so that we might better understand how the Earth fits in the larger story of the universe. Over the years, four NASA spacecraft have been sent to explore the planet Saturn. Pioneer 11 was first to fly past Saturn in 1979. Voyager 1 flew past a year later, followed by its twin, Voyager 2, in 1981. The latest remote explorer is the Cassini-Huygens mission, a cooperative venture between NASA, the European Space Agency, and the Italian Space Agency. Cassini is the first mission to explore the Saturn system of rings and moons from orbit. Cassini entered orbit on June 30, 2004 and immediately began sending back intriguing images and data. The European Space Agency's Huygens Probe dove into the thick atmosphere of Saturn's largest moon Titan in January 2005, and landed on the surface. The sophisticated instruments on both spacecraft are providing scientists with vital data and the best views ever of this mysterious, vast region of our solar system.

The marvelous panoramic view of Saturn shown here is a composite of 165 different images taken by the Cassini wide-angle camera over a period of three hours on September 5, 2006. With giant Saturn hanging in the blackness and sheltering Cassini from the Sun's blinding glare, the spacecraft viewed the rings as never before, revealing previously unknown faint rings and even glimpsing its home world.

Image and partial text credit: NASA/Jet Propulsion Laboratory/Space Science Institute.



This distant view of the Earth through the rings of Saturn is one of many wondrous images from Cassini's scientific exploration of the Saturnian system.

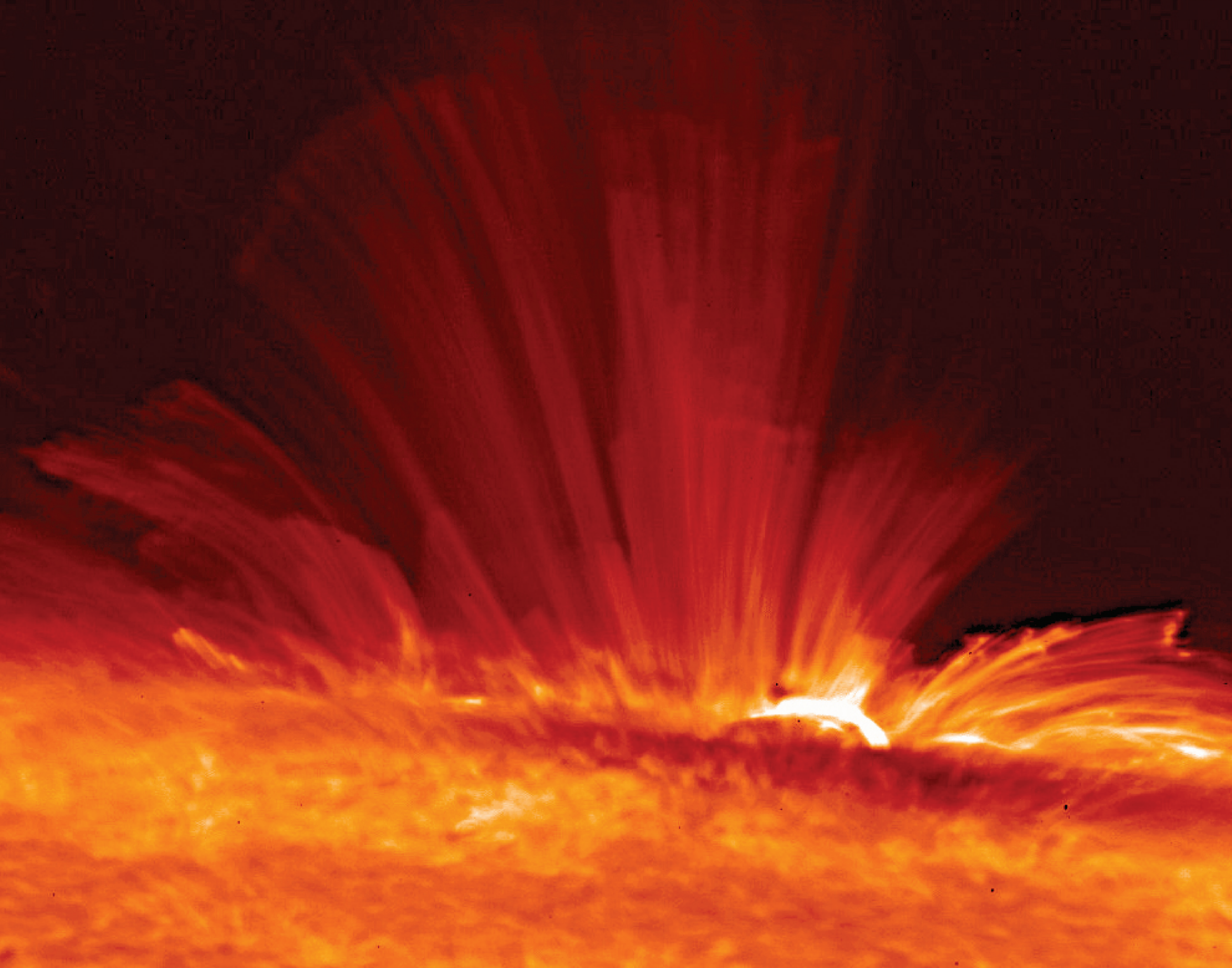
JANUARY 2008

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MARCH 2008

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March 2008



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| Daylight Saving Time Begins | | | | | | |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Palm Sunday | St. Patrick's Day | | | | Good Friday | |
| Easter | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

Magnetic Field Around a Sunspot

Space weather involves the production of energetic particles and emissions of electromagnetic radiation. These bursts of energy from the Sun can black out long-distance communications over entire continents and disrupt the global navigational system.

A collaboration between the space agencies of Japan, the United States (NASA), the United Kingdom, and Europe, *Hinode* (Japanese for *sunrise*—formerly known as Solar-B) is a mission to investigate the interaction between the Sun's magnetic field at its outer layer called the *corona* and determine how the Sun's explosive energy propagates through the different layers of the solar atmosphere. Measurements from *Hinode* reveal never-before-seen details of the structure of the Sun's magnetic field and the release of magnetic energy in the lower atmosphere spread outward through the corona and into interplanetary space to create space weather.

This particular image, taken on November 20, 2006, illustrates that the Sun's magnetic field is much more turbulent and dynamic than previously known and reveals tiny granules of hot gas that rise and fall in the Sun's magnetized atmosphere.

Image and partial text credit: NASA/Japan Aerospace Exploration Agency.



The Sun-observing *Hinode* satellite (formerly Solar-B) and its vehicle M-V-7 rocket launched on September 23, 6:36 am (Japan Standard Time) at Uchinoura Space Center, Kagoshima, Japan.

FEBRUARY 2008

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APRIL 2008

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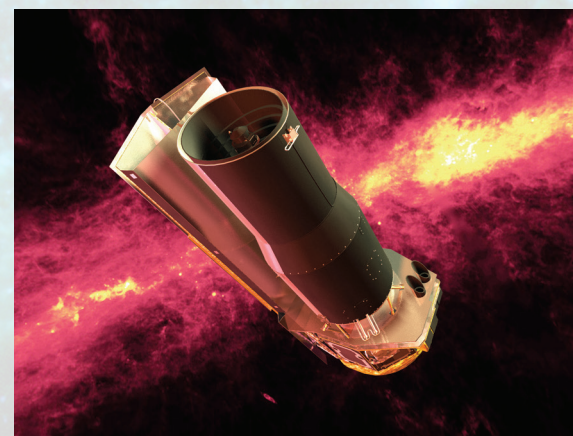
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| | | | Administrative Professionals Day | | | |
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Comets Kick up Dust in Helix Nebula

Sometimes there is more to the universe than meets the eye. When we view the same object at wavelengths other than the ones visible to human eyes, we begin to learn more about it and see it in a whole new light. NASA's Spitzer telescope is equipped with sensitive infrared instruments that give us a unique view of the Universe and allow us to peer into regions of space that are hidden from optical (visible) telescopes. Many areas of space are filled with vast, dense clouds of gas and dust which block visible light. Infrared light, however can penetrate these clouds, allowing us to peer into regions of star formation, the centers of galaxies, and newly forming planetary systems. Infrared also brings us information about the cooler objects in space, such as smaller stars that 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.

Though it looks somewhat like a close-up picture of the eye of a green monster, the image shown here is actually a Spitzer infrared image of the Helix nebula, located about 700 light-years away in the constellation Aquarius, and belonging to a class of objects called *planetary nebulae*. Discovered in the 18th century, these colorful beauties were named for their resemblance to gas-giant planets like Jupiter. Infrared light from the outer gaseous layers is represented in blues and greens. The white dwarf is visible as a tiny white dot in the center of the picture. The red color in the middle of the eye denotes the final layers of gas blown out when the star died.

Image and partial text credit: NASA/Jet Propulsion Laboratory-Caltech/University of Arizona.

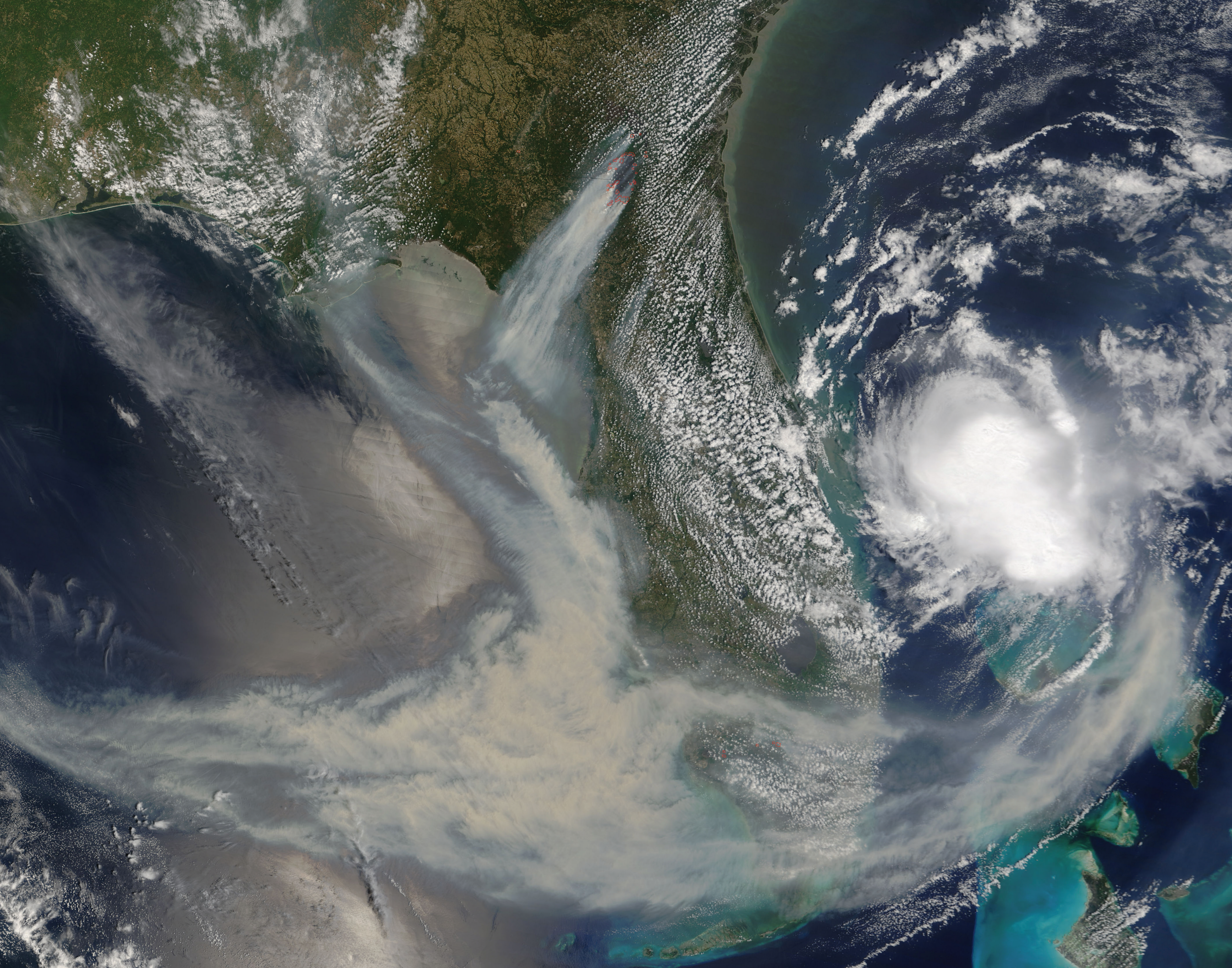


Spitzer rendered against an infrared (100 micrometer) sky.

| MARCH 2008 | | | | | | |
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| MAY 2008 | | | | | | |
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| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
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| Mother's Day | | | | | | |
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| | Memorial Day | | | | | |

Terra Observes Clouds and Smoke from Fires

NASA satellites help us study the behavior of clouds and aerosols—tiny particles such as dust and smoke—in our atmosphere. Data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra and Aqua helps scientists distinguish different types of clouds and aerosols and even pinpoint the locations of active fires on the surface.

The Terra MODIS captured this image on May 11, 2007. The Southeast U.S. was in the grip of moderate to extreme drought and the region's pine forests and plantations were particularly susceptible to rapidly spreading wildfires. When this image was obtained, huge fires were burning out of control over the rugged terrain of southern Georgia and Florida. (Areas where MODIS detected actively burning fires are outlined in red.) At around the same time, Subtropical Storm Andrea was bringing some light rain to Florida, though not nearly enough to halt the fires. At the time of the image, Andrea had dwindled to a ball of clouds in the Atlantic Ocean, and huge plumes of smoke from the wildfires snaked across Georgia, Florida, and the Gulf of Mexico. The image shows that MODIS can easily distinguish smoke—grey—from clouds—white. Although extreme fire behavior declined after May, smoldering and creeping fire continued until sufficient rain arrived to extinguish the flames.

In addition to MODIS, data from CloudSat and the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) further enhance NASA's observing capabilities. CloudSat's radar and CALIPSO's lidar complement MODIS and allow unprecedented three-dimensional views of the structure of clouds and aerosols.

Image and partial text credit: NASA/Goddard Space Flight Center/Earth Observatory/MODIS Rapid Response Team.

eos.nasa.gov



| APRIL 2008 | | | | | | |
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| JUNE 2008 | | | | | | |
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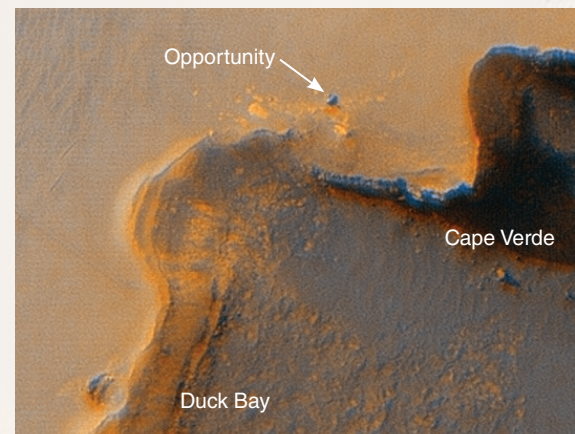
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
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| Father's Day | 22 | 23 | 24 | 25 | 26 | 27 |
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'Victoria Crater' at Meridiani Planum

NASA works to make today's science fiction tomorrow's science. One of NASA's long-term goals is to send human explorers to Mars. The first steps of this long journey are already underway. Since January of 2004, two small rovers, Spirit and Opportunity, have been exploring the surface of Mars. The two tiny spacecraft are exploring the rocks and soils at sites on opposite sides of Mars that appear to have been affected by liquid water in the past and could be favorable sights for future human exploration—the mechanical equivalent of a geologist walking the surface of Mars. More unmanned robotic missions to Mars are planned in the coming decade to prepare for the arrival of humans on the Red planet.

The High Resolution Imaging Science Experiment (HiRISE) camera onboard the Mars Reconnaissance Orbiter spacecraft obtained this image of Victoria crater, an impact crater at Meridiani Planum, near the equator of Mars. Since January 2004, Opportunity has been operating at Meridiani Planum. The rover can be seen in this image, at roughly the "ten o'clock" position along the rim of the crater.

Image and partial text credit: NASA/Jet Propulsion Laboratory/University of Arizona.

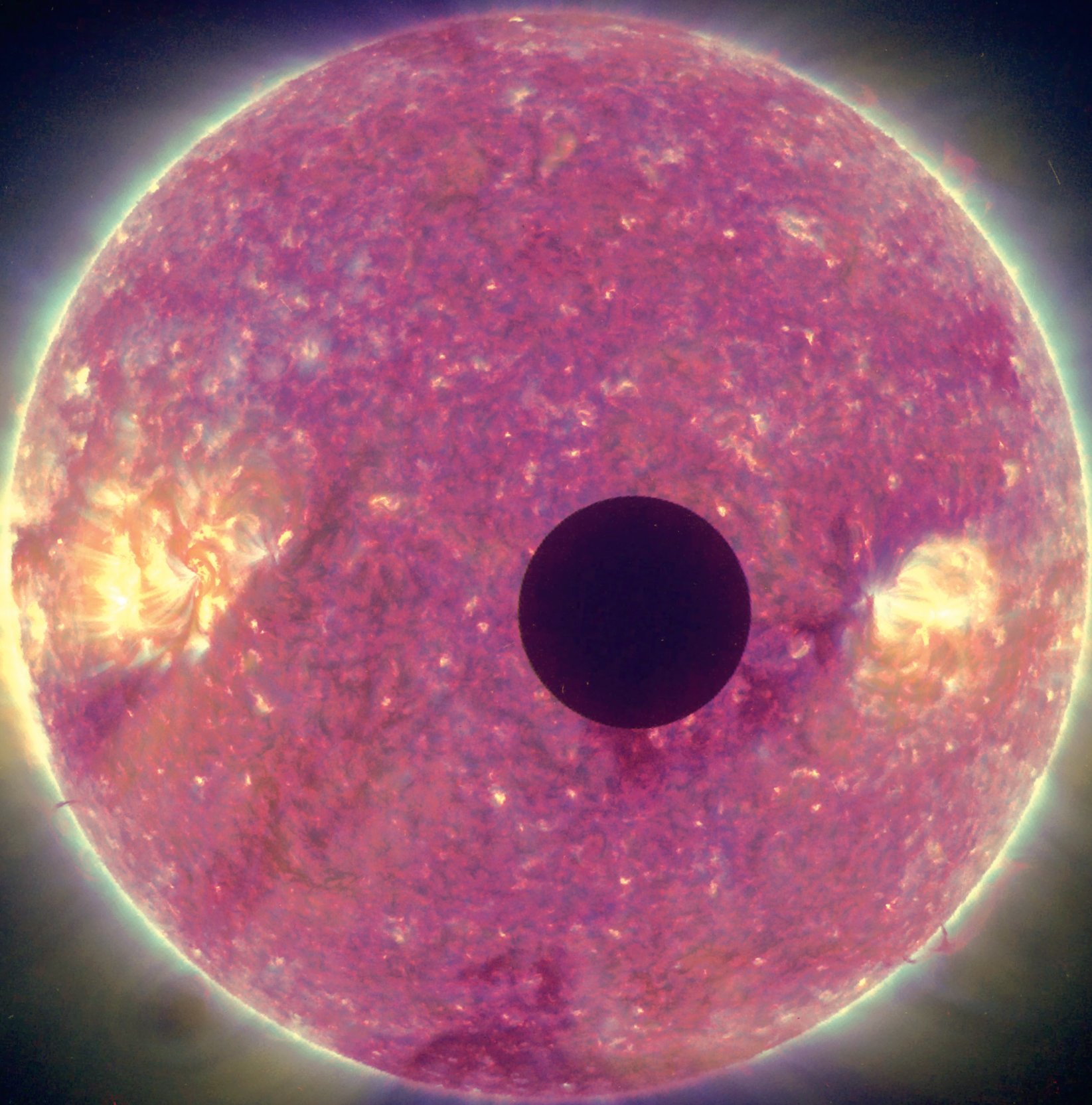


Annotated view showing the location of the Mars Exploration Rover Opportunity on October 3, 2006.

| MAY 2008 | | | | | | |
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| JULY 2008 | | | | | | |
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Independence Day

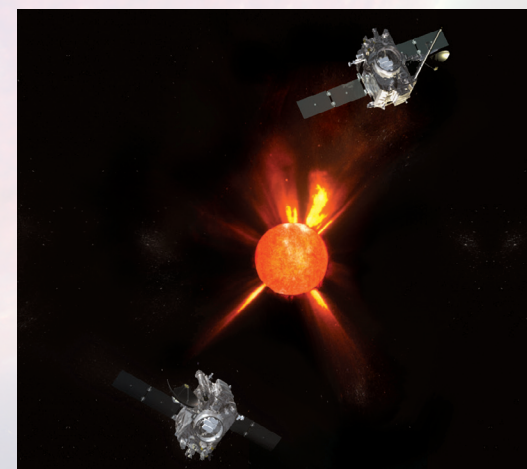
Solar Eclipse, STEREO Style

Coronal mass ejections (CMEs), are powerful eruptions that can blow up to 10 billion tons of the Sun's atmosphere into interplanetary space. Traveling away from the Sun at speeds of approximately one million miles per hour (1.6 million kilometers per hour), CMEs can create major disturbances in the interplanetary medium and trigger severe magnetic storms when they collide with Earth's magnetosphere. Such storms pose a hazard to Earth orbiting satellites, are extremely hazardous to astronauts when performing Extra Vehicular Activities (EVAs) outside of the protection of the Space Shuttle, and have even been known to cause electrical power outages on Earth.

The Solar Terrestrial Relations Observatory (STEREO) consists of two space-based observatories—one ahead of Earth in its orbit, the other trailing behind. With this new pair of viewpoints, scientists can observe the structure and evolution of solar storms as they blast from the Sun and move out through space.

This image from February 25, 2007, is a STEREO Style Transit of the Moon (shadow) across the face of the Sun visible only from the STEREO-B spacecraft in its orbit about the Sun, trailing behind the Earth.

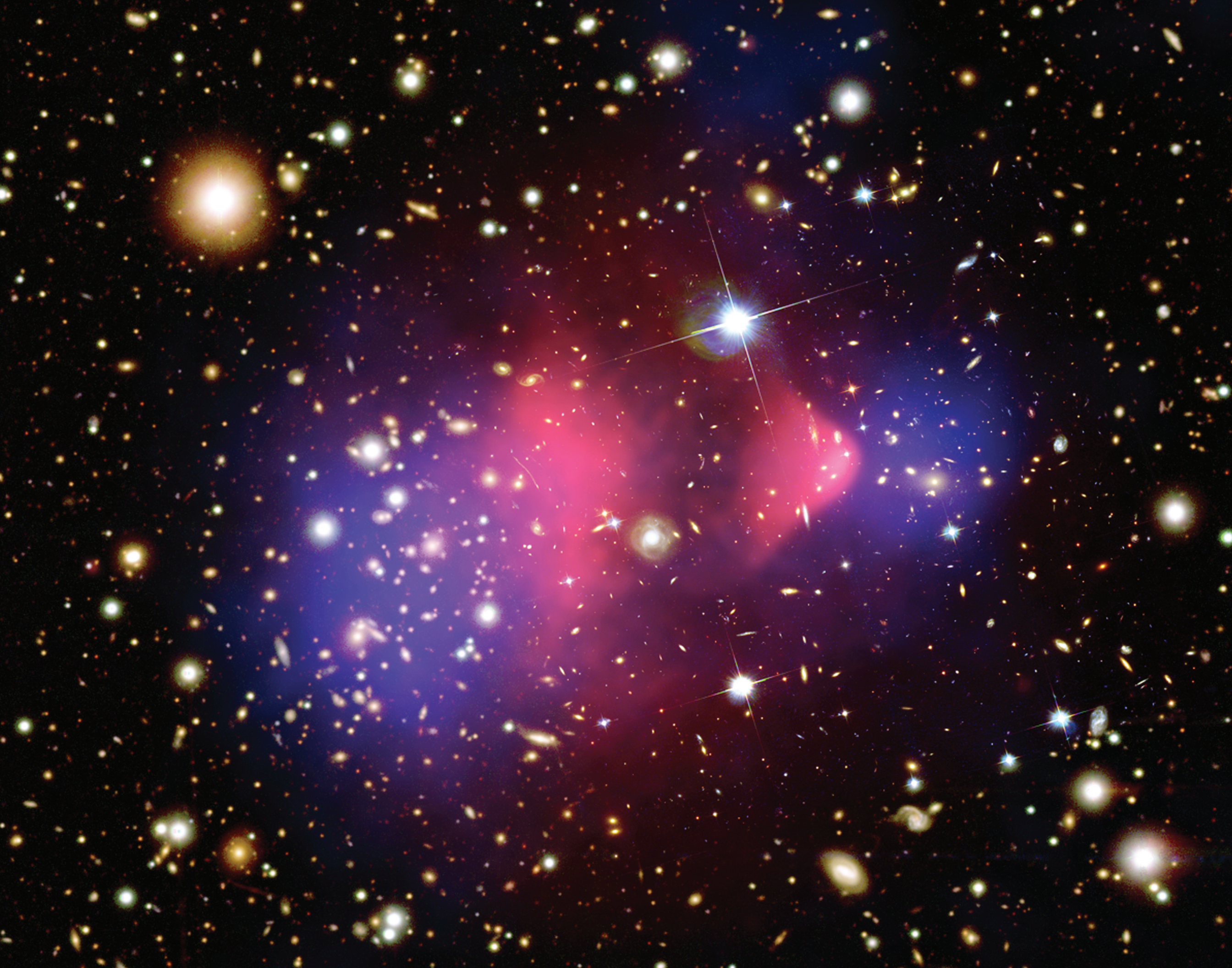
Image and partial text credit: NASA.



Artist's rendition of the pair of STEREO spacecraft juxtaposed with an image of the Sun.

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August 2008



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The Bullet Cluster: A Smoking Gun in the Search for Dark Matter

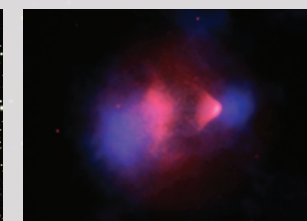
Over the years, scientists have used different methods to determine the mass of galaxies, but all reach the same conclusion: approximately ninety percent of the mass of the universe is missing. Many scientists believe that the missing mass is matter that exists in a form that is invisible to all electromagnetic radiation. That means scientists can't observe this dark matter directly; but they can still detect its presence by observing the impact the invisible mass has on gravity.

This image of the Bullet Cluster (Galaxy Cluster 1E 0657-56), combining X-ray data from Chandra and Hubble and visible data from Magellan, is the most conclusive evidence to date that dark matter actually exists. This cluster was formed after the collision of two large clusters of galaxies—the most energetic event known in the universe since the Big Bang. The bullet-shaped clump on the right is the hot gas from one cluster, which passed through the hot gas from the other larger cluster during the collision. An optical image from Magellan and the Hubble Space Telescope shows the galaxies in orange and white. The blue areas in this image show where astronomers find most of the mass in the clusters. The concentration of mass is determined using the effect of so-called *gravitational lensing*—i.e., the gravitational effect caused by the very large mass of the dark matter focuses the light beam and makes the object brighter than it would otherwise be. Most of the matter in the clusters (blue) is clearly separate from the normal matter (pink), suggesting that nearly all of the matter in the clusters is dark.

Image and partial text credit: NASA/Chandra X-ray Center/Center for Astrophysics/European Organisation for Astronomical Research/Space Telescope Science Institute/University of Arizona.



X-ray/Optical



X-ray/Lensing Map



Optical/Lensing Map



Optical

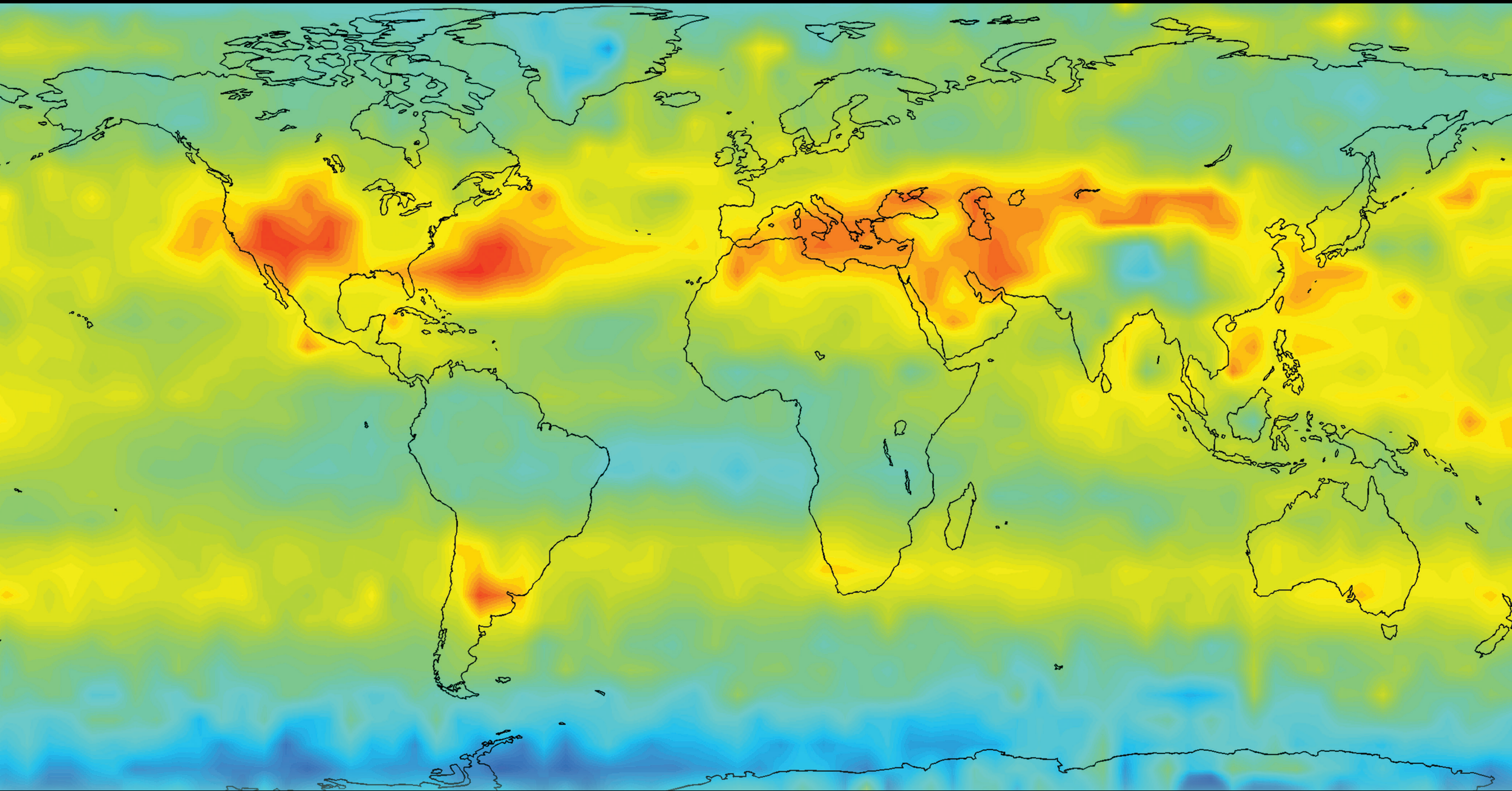
JULY 2008

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SEPTEMBER 2008

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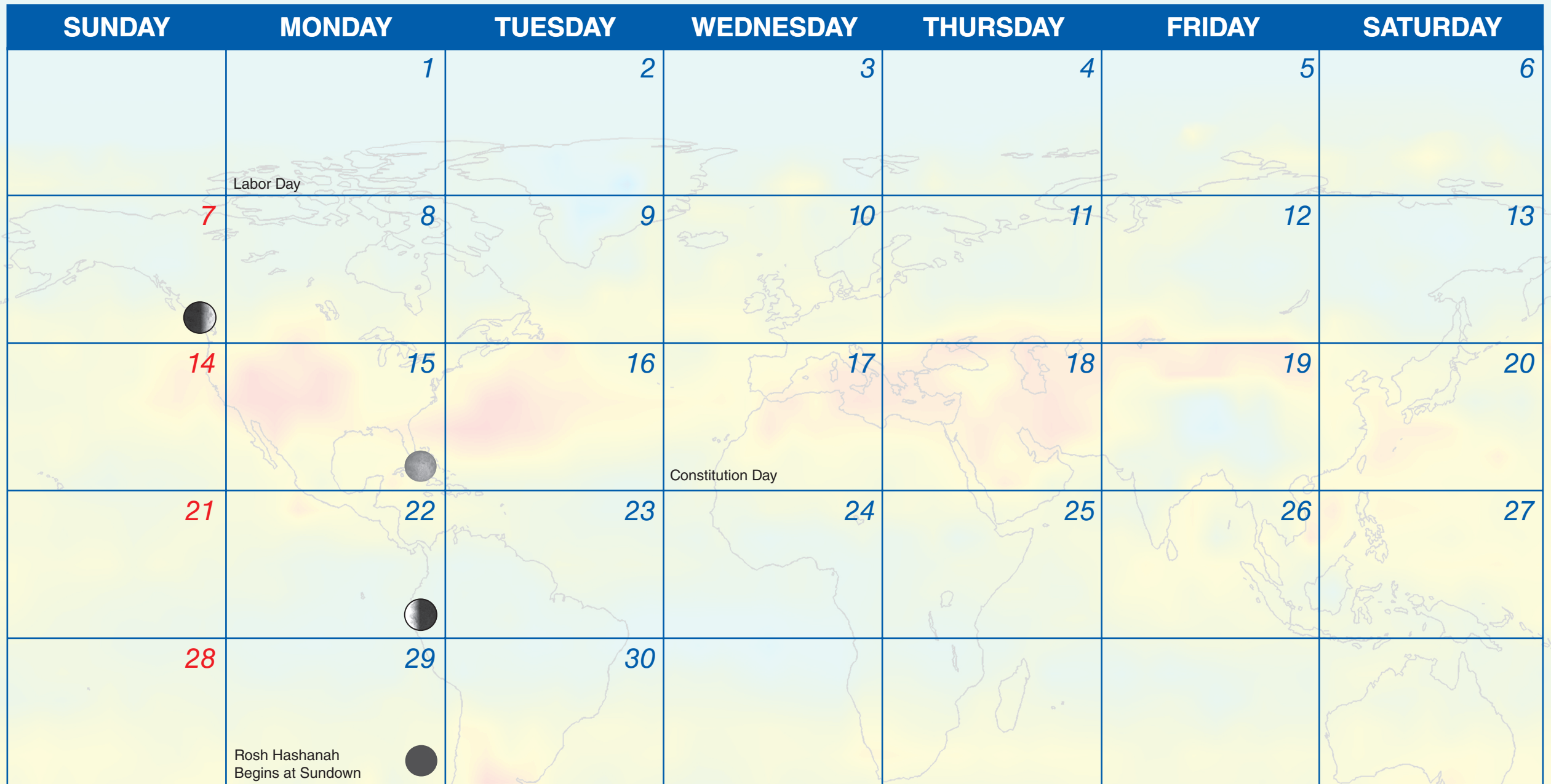
NASA AIRS Mid-Tropospheric Carbon Dioxide



365 370 375 380

Concentration in parts-per-million by volume

September 2008



AIRS Measures Carbon Dioxide

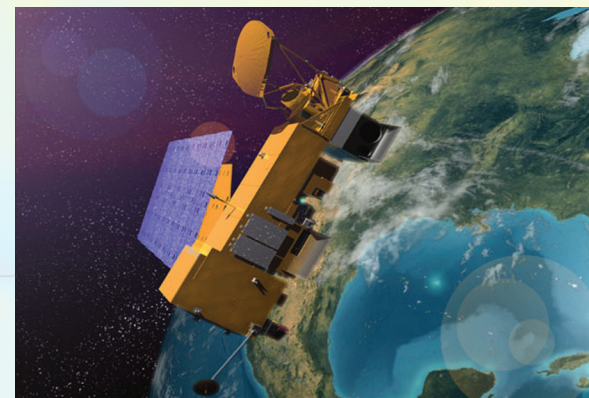
NASA satellites help scientists study the makeup of our atmosphere, including the concentration of important greenhouse gases such as carbon dioxide. Although originally designed to measure atmospheric water vapor and temperature for weather forecasting, scientists working with the Atmospheric Infrared Sounder (AIRS) on NASA's Aqua satellite have devised a new and innovative method to use AIRS to make the first global measurements of atmospheric carbon dioxide from space.

The global map of mid-tropospheric carbon dioxide shown here was created using AIRS data from 2003 and reveals that despite the high degree of mixing that occurs with carbon dioxide, regional differences can still be seen by the time the gases reach the mid troposphere. Climate modelers are currently using the AIRS data to examine the global distribution and transport of carbon dioxide and improve their models.

This groundbreaking research using AIRS data paves the way for new sensors that measure carbon dioxide through the entire atmospheric column to monitor surface sources and sinks of this gas. One such sensor is the Orbiting Carbon Observatory (OCO). Once OCO is launched, AIRS measurements of upper tropospheric carbon dioxide can be combined with OCO data to retrieve near-surface concentrations more accurately.

Image and partial text credit: NASA/Jet Propulsion Laboratory.

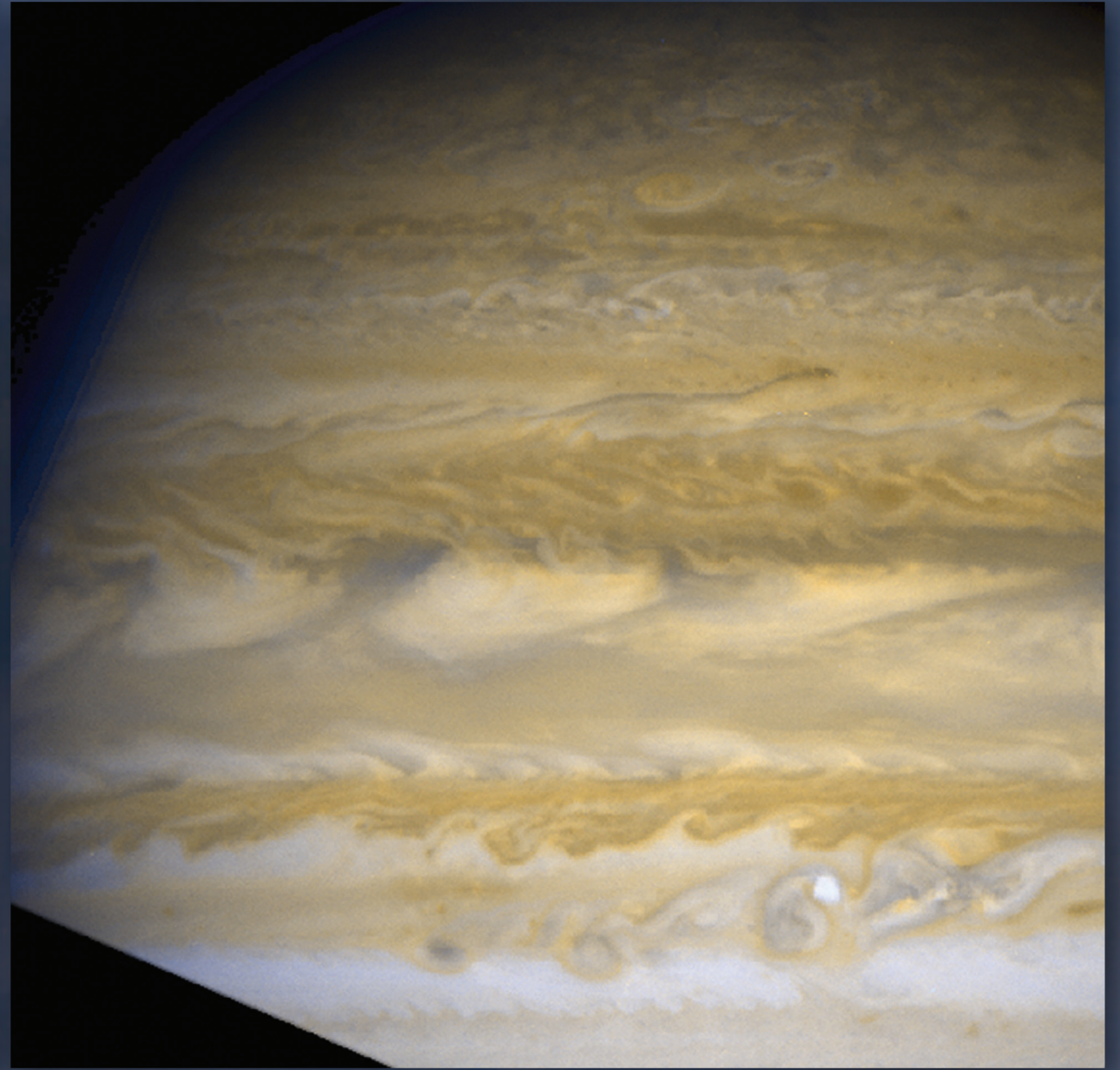
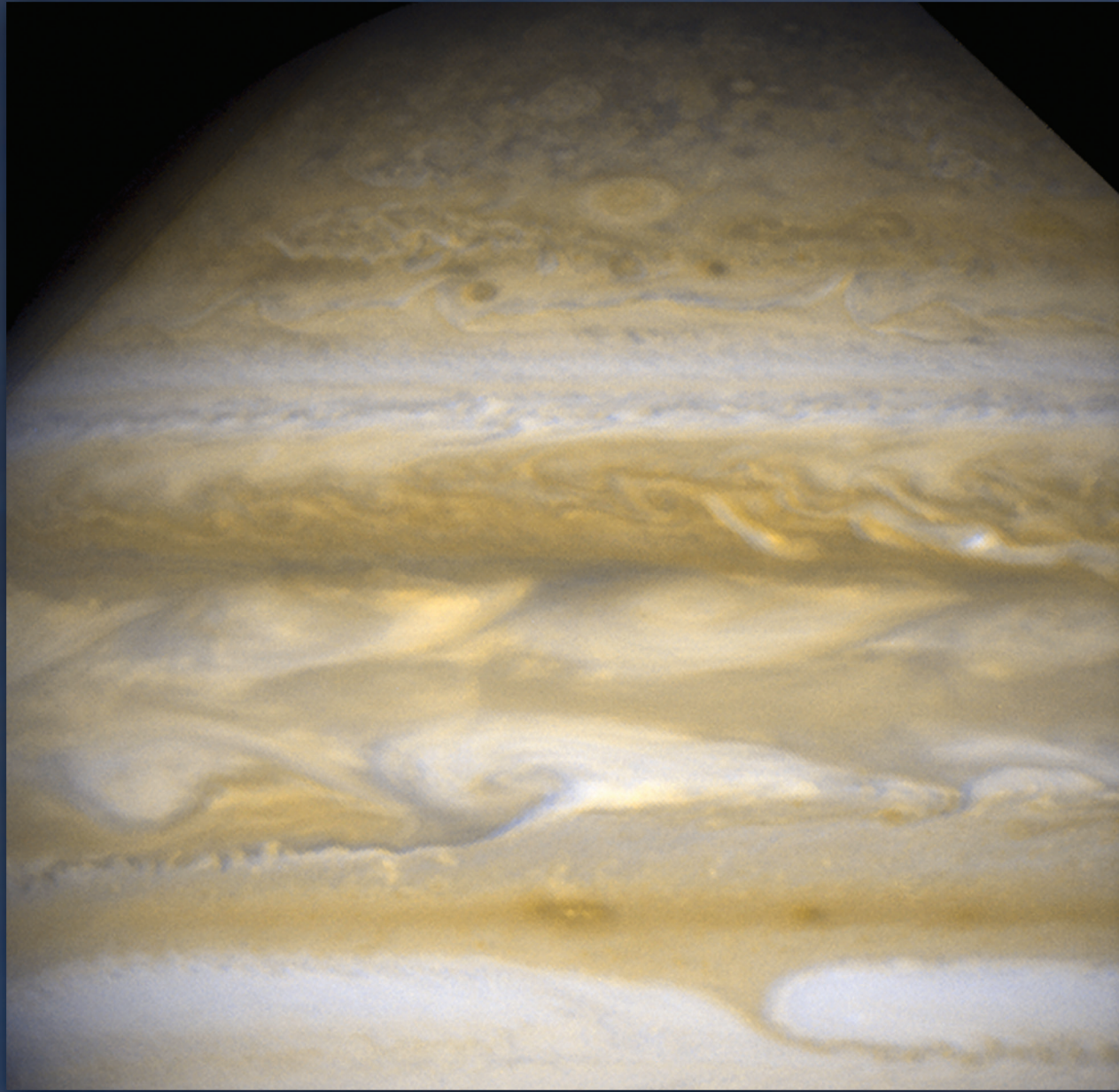
eos.nasa.gov



Artist's rendering of the Aqua spacecraft flying over the Caribbean Sea and Mexico.

| AUGUST 2008 | | | | | | |
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| OCTOBER 2008 | | | | | | |
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October 2008



| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|--------|--------------|--|--------------------------|----------|-----------|----------|
| | | | 1 | 2 | 3 | 4 |
| | | | NASA's First Day in 1958 | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | |  Yom Kippur Begins at Sundown | | | | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | Columbus Day |  | | | | |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
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| | |  | | | Halloween | |

Hubble Catches Jupiter Changing Its Stripes

Astronomers have been observing the movement of Jupiter's turbulent clouds for several decades using ground-based telescopes and observations from space. The clouds are always changing as they encounter atmospheric disturbances while sweeping around the planet at hundreds of miles per hour.

Two new images from Hubble's Wide Field and Planetary Camera 2 obtained March 25, 2007 (left image) and June 5, 2007 (right image) respectively are some of the most detailed views of Jupiter's stormy surface ever obtained and reveal that entire bands of clouds can change in the span of a few months. Images like these can help astronomers improve their understanding of the behavior of the gaseous atmosphere of the Solar System's largest planet.

In the March image, we see thin bands of white clouds above Jupiter's equator. The white color indicates clouds at higher altitudes in Jupiter's atmosphere. In the June image, the band's white hue has turned brown, showing clouds deep within the planet's atmosphere. The whole band of clouds appears to have merged with the one below it. In the same cloud band above the equator, the small swirls in the March image have morphed into larger wave-like features in the June image. Dominating the band is a dark streak that resembles a snake. This serpent-shaped structure is actually a small tear in the cloud deck, which gives astronomers a view deep within the atmosphere. Below the equatorial region, the brownish upside-down shark fin in the March image is no longer visible in the June image. Appearing instead are brownish, tongue-shaped clouds with a stream of white swirls below them.

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



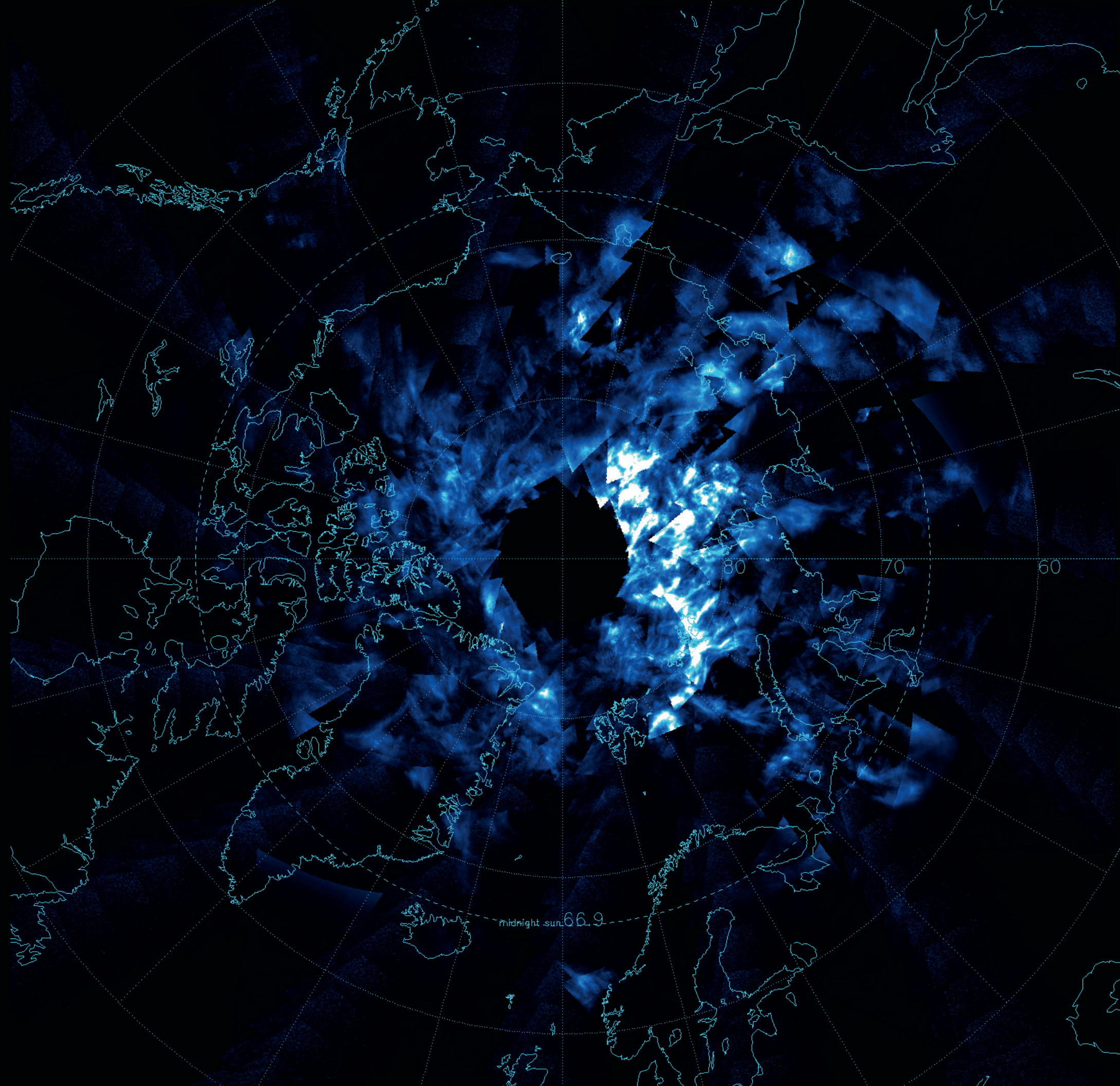
This true color image of Jupiter was taken with Hubble's Wide Field Planetary Camera 2 on February 17, 2007. Credit: NASA, ESA, and the Hubble Heritage Team (AURA/STScI).

SEPTEMBER 2008

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NOVEMBER 2008

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November 2008



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| | | | | | | 1 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 All Saint's Day |
| 9 Daylight Saving Time Ends | 10 | 11 Election Day | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 Veterans Day | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | Thanksgiving Day | | |

Taking AIM at Night-Shining Clouds

Noctilucent, or night-shining clouds are the highest clouds on Earth, existing about 80 kilometers above the surface of the Earth—i.e., they are clouds at the edge of space. These clouds reflect the setting Sun's light and can be viewed from the ground with the naked eye at around twilight. They form in the spring and summer at high latitudes and have been recorded for over a century. Noctilucent clouds are also referred to as Polar Mesospheric Clouds (PMC) when viewed from space platforms with instruments that can sense their presence at any time of the night or day.

This is one of the first pictures of PMCs from the new Aeronomy of Ice in the Mesosphere (AIM) satellite. The outlines of the continents have been added to clarify where the clouds are geographically.

There has been some evidence that PMCs are being seen more often at lower latitudes. The AIM spacecraft will provide the best systematic study of them to date and will investigate whether there is a connection between global climate change and the formation of these noctilucent clouds. Previous satellites have inferred the presence of PMCs but were not designed to determine their properties.

Image and partial text credit: NASA/Hampton University/Virginia Tech/University of Colorado Laboratory for Atmospheric and Space Physics.



This image is of noctilucent clouds that were seen from the ground on June 15, 2007. Credit: Veres Viktor, Budapest, Hungary.

OCTOBER 2008

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DECEMBER 2008

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December 2008



| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
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| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| Hanukkah Begins at Sundown | | | | Christmas Day | | |
| 28 | 29 | 30 | 31 | | | |

Eyewitness to a Collision of Galaxies

Since the earliest days of astronomy, astronomers have shared a goal to see farther and more clearly. The Hubble Space Telescope's launch into orbit around the Earth in 1990 sped humanity to one of its greatest advances in that journey. Its position above the atmosphere, which distorts and blocks the light that reaches our planet, gives the Hubble Space Telescope a view of the universe that typically far surpasses that of ground-based telescopes.

Hubble obtained this image (released on October 16, 2006) of the Antennae galaxy—so-named because of the long antenna-like “arms” extending far out from the nuclei of the two galaxies. The orange blobs to the left and right of image center are the two cores of the original galaxies and consist mainly of old stars criss-crossed by filaments of dust, which appear brown in the image. The two galaxies are dotted with brilliant blue star-forming regions surrounded by glowing hydrogen gas, appearing pink in the image.

The image allows astronomers to better distinguish between the stars and super star clusters created in the collision of two spiral galaxies. Astronomers estimate that about a hundred of the most massive of the clusters will survive to form regular globular clusters, similar to the globular clusters found in our own Milky Way galaxy.

Image and partial text credit: NASA/European Space Agency/Space Telescope Science Institute/Hubble Heritage Team/Association of Universities for Research in Astronomy.



The Space Shuttle views Hubble from above.

| NOVEMBER 2008 | | | | | | |
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