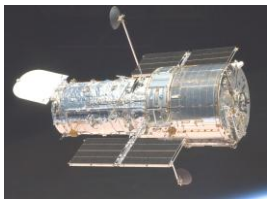

Jupiter News

OLD PLANET: NEW DISCOVERIES

WWW.NASA.GOV/LARGEST OUT OF THIS WORLD NEWS - SEPTEMBER 15, 2009-

Impact 2009!!

What hit Jupiter?

On July 19th, 2009, amateur astronomer Anthony Wesley of Australia noticed a new "black scar" on Jupiter. He reported his findings to professional scientists who confirmed that Jupiter was indeed hit by an unknown object and that the black scar is actually a debris field created from the impact.

Scientists all over the world have begun studying the impact site to look for clues to try and find out what hit Jupiter.

Using NASA Hubble Space Telescope imagery, scientists were able to measure the size of the scar to be about twice the size of the United States.

Comparing this new scar to the scars created during the 1994 impacts from the 21 fragments of the Shoemaker-Levy 9, scientists estimate the size of the object that hit Jupiter to be approximately a few hundred meters in diameter.

Shoemaker Levy 9 Comet Impact of 1994

Fast Facts

- ***Jupiter** is the 5th planet from the sun and the **LARGEST** planet in our solar system.*
- *Jupiter is a Gas **GIANT,** made of mainly Hydrogen, Helium*
- *Jupiter's Red Spot is a **HUGE** active storm.*
- *Jupiter 's **Colossal** magnetic field creates spectacular aurorae.*
- ***Dynamic** Jupiter has bands, rings, moons, lightning and auroras at both poles.*

Conduct your own "Impactor Size Studies"

http://www.nasa.gov/centers/goddard/pdf/385551main_ImpactorStudy.pdf

Scientists are collecting data of the scar at different wavelengths to study the chemical composition and evolution of the debris cloud, which may provide clues about the impactor, as well as the atmosphere.

Increased levels of ammonia gas have been detected but are thought to have been brought up from below the clouds during the impact.

Due to Jupiter's strong winds, the 2009 impact scar will soon disappear into Jupiter just as the Shoemaker-Levy 9 clouds did in 1994. Until then scientists will continue to study the impact's debris and by comparing past and future images will be able to study Jupiter's strong winds high above the clouds.

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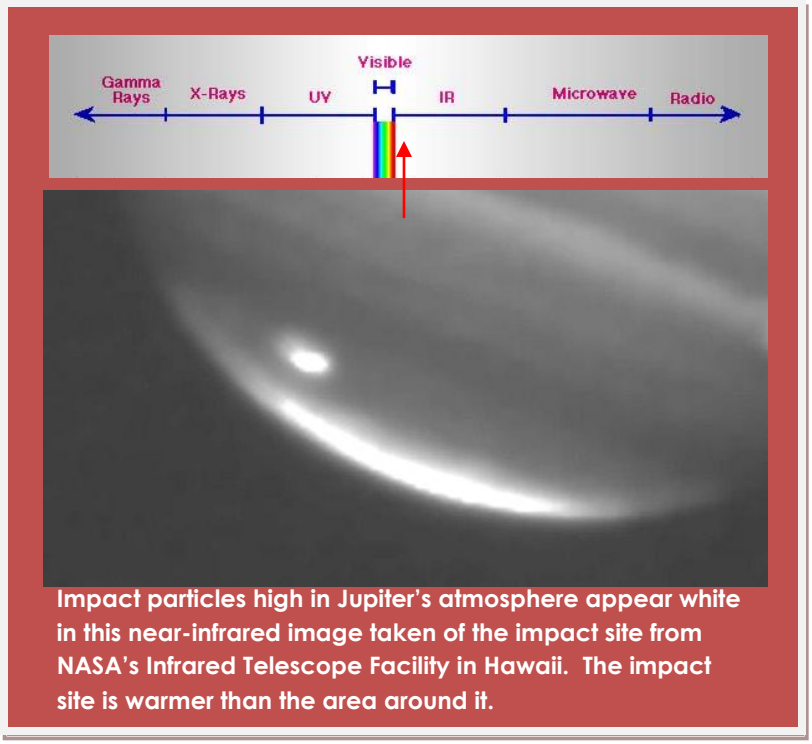
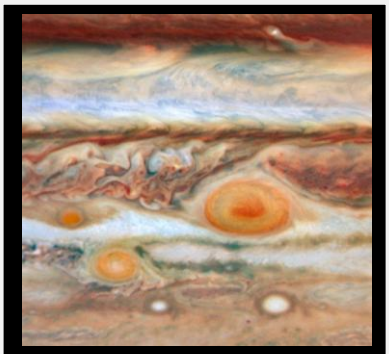


Impact particles high in Jupiter's atmosphere appear white in this near-infrared image taken of the impact site from NASA's Infrared Telescope Facility in Hawaii. The impact site is warmer than the area around it.

When Storms Collide

What are Jupiter's Spots?



Three red spots on Jupiter

While watching two large red storms pass each other in 2008, a third storm made a surprise appearance, giving scientists even more to study in Hubble Space Telescope data.

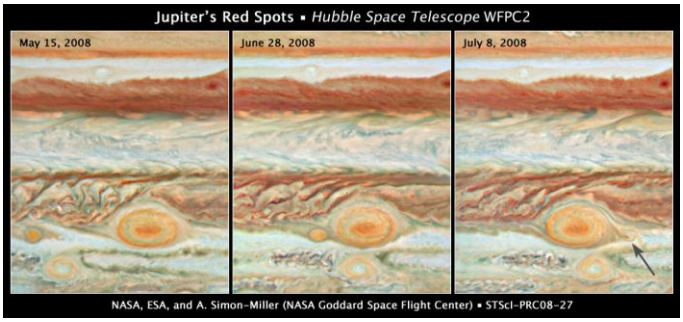
Jupiter's red spots (and many other round white spots) are massive high pressure storms powered by warm air rising in their centers. The "Great Red Spot", observed by telescopes for over 150 years, is the largest anticyclone known in the solar system. It is an anticyclone because it rotates counter clockwise and is a high pressure system; the exact opposite of a southern hemisphere hurricane.

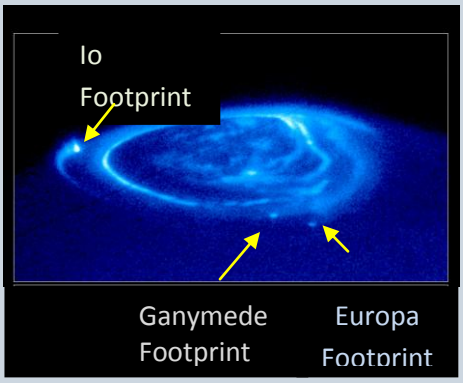
The second red spot formed as three white storms merged together between 1998 and 2000. The single remaining storm became strong enough to dredge up material from below that perhaps chemically reacts with sunlight to turn red. A third red spot showed up west of the Great Red Spot earlier in 2008.

Wind speeds in Red Spot Jr. are estimated to be around 400 mph and have been tracked as fast as 650 kilometers an hour. Scientists are able to calculate wind speeds by tracking small features observed in the storms over time. As the storms passed by each other in 2008, the smallest storm passed south of the Great Red Spot, and around to the east. Part of it was pulled into the Great Red Spot, while some remnants of it continued on slowly to the east. These interactions with very small storms may also help power the Great Red Spot by feeding their energy into it.

View the "Winds in the World" Weather Forecast for Jupiter's Red Spot

http://www.sciencenewsforkids.org/articles/20070502/Feature1.asp





Aurora on Jupiter imaged in ultra violet by NASA's Hubble Space Telescope

Find out about Goddard's RADIO JOVE Listening to Jupiter Program

http://radiojove.gsfc.nasa.gov/

Celestial Lighthouse

Magnetic fields give us the time of day

Deep inside Jupiter, the atmosphere is dense enough to act like a fluid metal. Due to Jupiter's fast rotation, this fluid generates a very strong, invisible, magnetic field, so large that if visible from Earth, it would appear larger than the Moon.

Many planets have magnetic fields, including Earth, which is why a compass always points towards magnetic north. This field is also responsible for majestic aurorae on Jupiter, like the spectacular Northern and Southern Lights seen on the Earth. An aurora forms when energetic particles from the Sun interact with this invisible field and hit the upper layers of the atmosphere, causing it to glow. At Jupiter, small particles blasted off the surfaces of Io, Europa and other moons are also trapped by the magnetic field and the small footprint of each satellite can be seen.

However, Jupiter's magnetic field is tilted relative to its rotation axis, such that the magnetic pole sweeps in and out of view like the light in a lighthouse. As particles hit the atmosphere near the magnetic pole, small energy bursts are released and can be detected by radio receivers, allowing us to measure the length of day on Jupiter. With no solid surface features to track, this is the only way to know how fast this giant planet spins.

Zap! Cloud to Cloud Lightning

What causes lightning on Jupiter and how strong is it?

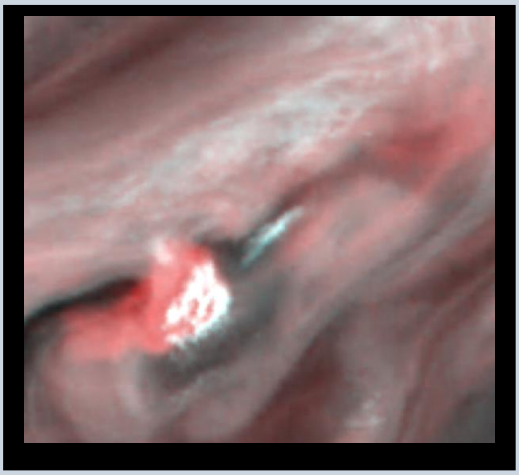
The New Horizons Mission used Jupiter for a gravity assist in 2007 while on its way to Pluto. Night side imaging captured lightning strikes near Jupiter's North and South poles and equator. Some of the bolts were 10 times as powerful as anything ever recorded on Earth, but may be the sum of multiple strikes at a single location while the image was taken. Lightning was also seen by the Galileo Jupiter mission in the 1990s and Voyager in 1979.

As on Earth, Jupiter storms are caused by the process of convection. Gases, including water vapor rise from deep within the planet. As they freeze, ice particles rub past each other, building a charge, which is discharged as lightning. The storms on Jupiter are much larger than Earth's perhaps resulting in the more powerful lightning.

While lightning had been observed at lower latitudes on Jupiter, this is the first time lightning was imaged near the poles. New Horizons observed 6 lightning strikes in Jupiter's north pole region, 7 in the south pole and 5 near the equator. Scientists were pleased with the New Horizon observations which confirmed their belief that Jupiter radiates heat uniformly throughout the planet out to space.

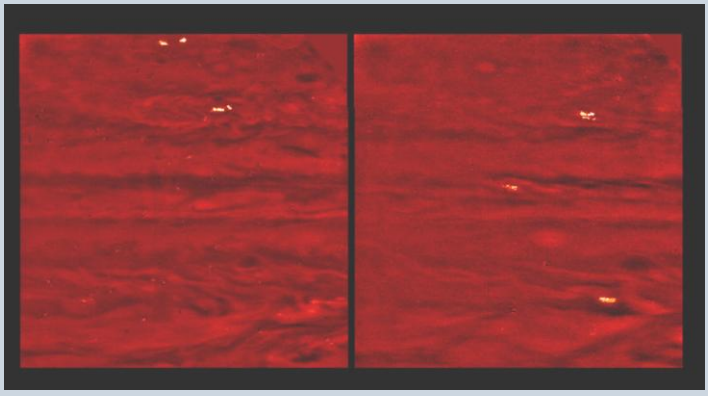
Conduct Your Own Convection Investigations

http://www.nasa.gov/centers/goddard/pdf/385552main_ConvectionInvestigation.pdf



Left: A water cloud thunderstorm northwest of the Great Red Spot taken by the Galileo Spacecraft in1996. The white cloud in the center is a tall, thick cloud 1000km across and 25km high.

Below: Bright storms can be seen at two latitudes in the left image, and at three latitudes in the right image. Each storm was made visible by multiple lightning strikes during the exposure.



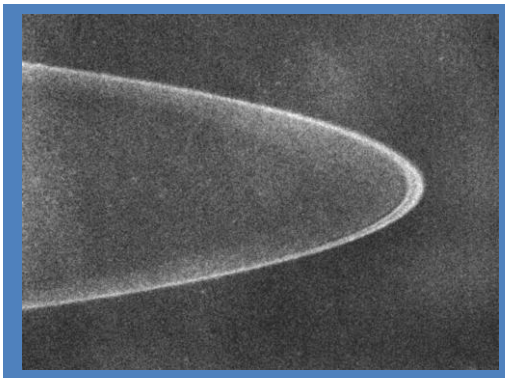
Jupiter's Ring Formation Theories Confirmed

How did Jupiter's Rings Form?

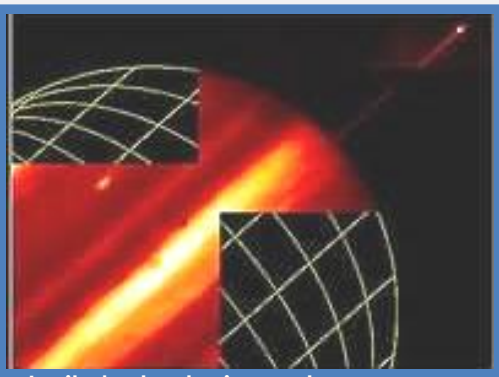
Jupiter's faint rings were first discovered by the Voyager 1 spacecraft in 1979, when it looked back at Jupiter and towards the Sun. They are so faint and tenuous, they are only visible when viewed from behind Jupiter and are lit by the Sun, or directly viewed in the infrared where they faintly glow. Unlike Saturn's icy rings full of large icy and rock chunks, they are composed of small dust.

Early in its mission to Jupiter, the Galileo spacecraft made observations that provided confirmation on how Jupiter's rings were formed, as the dust was seen to coincide with small moon locations: the two Gossamer rings near the small moons Amalthea and Thebe and the main ring near Adrastea and Metis. Scientists had long believed that dust coming off of Adrastea and Metis formed the main ring, but were unsure of the origin of the Gossamer rings.

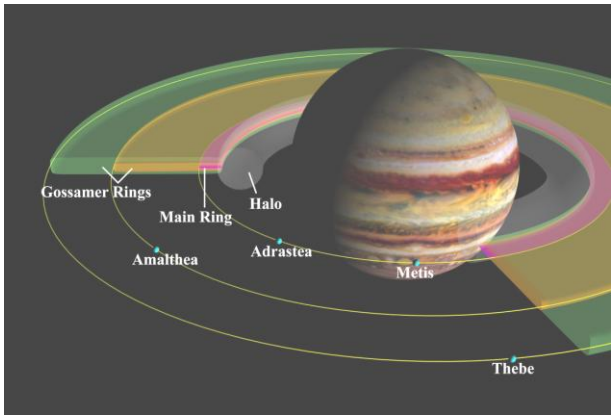
Jupiter's rings are formed from dust particles hurled up by micro-meteor impacts on Jupiter's small inner moons and captured into orbit. If the impacts on the moons were any larger, then the larger dust thrown up would be pulled back down to the moon's surface by gravity. The rings must constantly be replenished with new dust from the moons to exist.

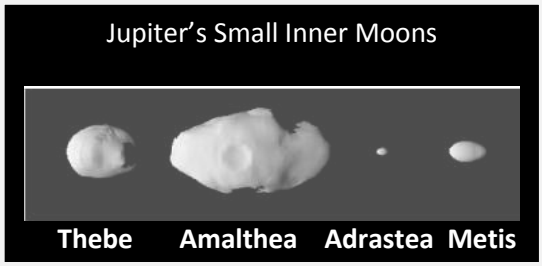


New Horizon's space craft Image of Jupiter's faint dust rings

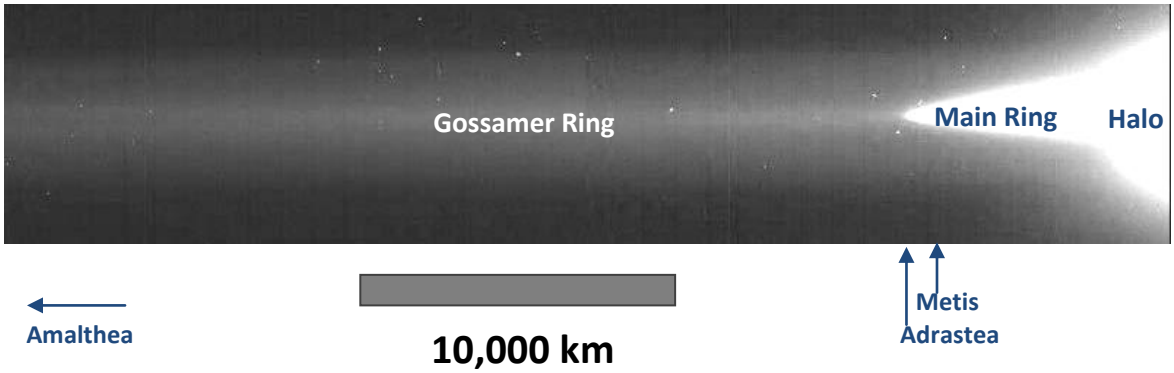


Jupiter's clouds, ring and even a moon can be seen in this Infrared image taken by NASA's Hubble Space Telescope.





Jupiter: Gossamer Ring



Compare the Rings of Jupiter, Saturn, Neptune and Uranus

http://solar-system-astronomy.suite101.com/article.cfm/planetary_ring_systems

View Hubble's Jupiter Image Gallery

http://hubblesite.org/gallery/album/query/Jupiter/

Jupiter's Dynamic Atmosphere

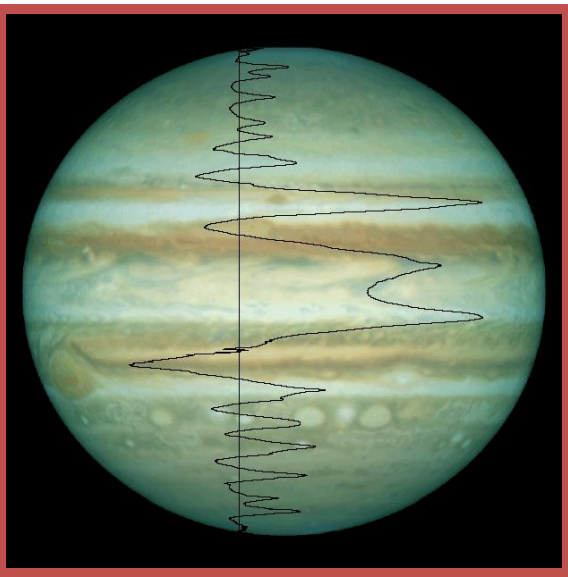
How does Jupiter get its striped atmosphere?

The most obvious features on Jupiter are the alternating bands of white and colored clouds, zones and belts. As of yet, no one knows what gives the clouds the colors they have, but scientists have theories on why the stripes exist.

Analysis of data at many wavelengths shows that the white regions have higher thicker, clouds than the redder regions. This may mean there is active cloud formation in those regions, producing fresh white clouds. The clouds in the reddish brown "belts" are deeper, covered by thick smog-like haze.

These belts and zones are also lined up with Jupiter's strong wind field, which may drive the cloud formation. The winds alternate from eastward to westward with latitude and can top 150 m/s (325mph).

An interesting aspect is that the winds are extraordinarily constant: the wind speed at a given latitude varies very little over time. Scientists are still studying what drives the winds and why they are so constant, even as massive changes occur in cloud color and structure.



The wind velocities on Jupiter have been added to this image. The vertical black line equals zero wind speed. The highest velocities exceed 150m/s (~325mph).

Jupiter's turbulent clouds are always changing as they encounter atmospheric disturbances while sweeping around the planet at hundreds of miles per hour. Notice in these Hubble Space Telescope images the changes in the shape and color of Jupiter's clouds near the equator.

As seen in the infrared and visible images above two continent -sized storms erupted in Jupiter's atmosphere in March 2007. Internal heat drives Jupiter storms.

Jupiter News - 2009 Edition

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