

# Júpiter

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## 1- Abstract:

Our project is based on research of the planet Jupiter. To carry out this project, students have researched Jupiter. It has also made a study of Jupiter compared to our planet Earth, showing similarities and differences also important facts about the past and future of the star.

Jupiter is the fifth planet of the Solar System. Part of the so-called outer or gaseous planets. Named after the Roman god Jupiter (Zeus in Greek mythology).

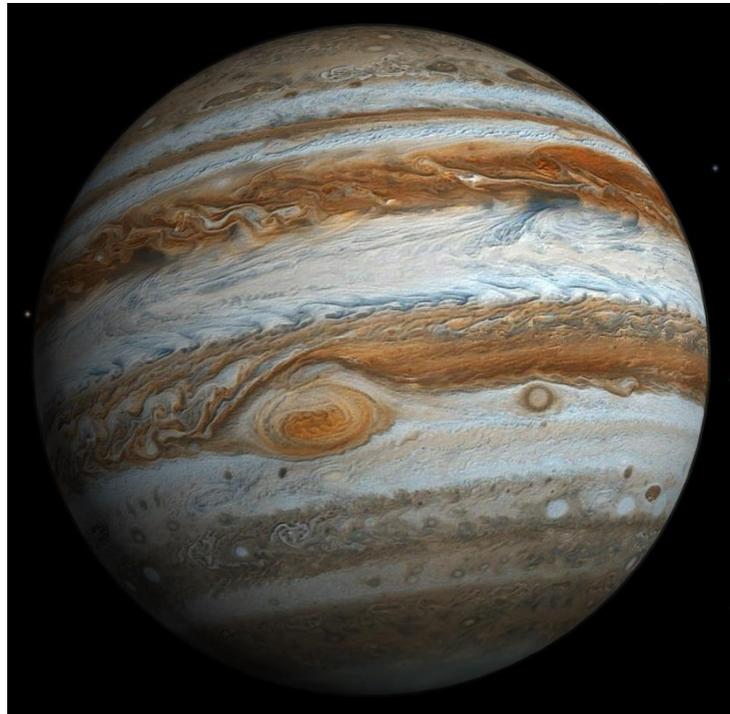
This is the planet that offers greater brightness throughout the year depending on its phase. It is also, after the Sun, the largest celestial body of the Solar System, with a mass almost two and half times that of the other planets combined (with a mass 318 times that of Earth).

Jupiter is a gaseous massive body, composed mainly of hydrogen and helium, lacking a defined inner surface. Between the atmospheric details include the Great Red Spot, a huge

anticyclone located in the tropical latitudes of the southern hemisphere, the structure of clouds in dark bands and bright areas, and global atmospheric dynamics determined by intense zonal winds alternating in latitude and speeds to 140 m / s (504 km / h).

## 2- Development:

Jupiter is the most massive planet in the solar system: is equal to about 2.48 times the sum of the masses of all the other planets combined. However, it is not the most massive planet known: more than one hundred extra solar planets that have been discovered have similar or superior to that of Jupiter masses.



Jupiter also has the fastest rotation speed of the planets of the Solar System: tour in less than 10 hours on its axis. This speed of rotation is deduced from measurements of the magnetic field of the planet. The atmosphere is divided into regions with strong zonal winds with periods of rotation that go from 9h 50m 30s in the equatorial zone to 9h 55m 40s in the rest of the planet.

The planet is known by an enormous meteorological formation, the Great Red Spot, easily visible by amateur astronomers because of its large size, larger than the Earth. Its atmosphere is permanently covered with clouds that allow trace atmospheric dynamics and show a high degree of turbulence.

Referencing the distance from the Sun, Jupiter is the fifth planet from the sun. Its orbit lies approximately 5 AU, about 750 million kilometers from the sun.

### The Great Red Spot:

The English scientist Robert Hooke in 1664 observed a weather formation could be the Great Red Spot (known in English by the acronym GRS). However there seems no subsequent reports of observation of this phenomenon until the twentieth century. In any case, it varies greatly both color and intensity. The images obtained by the Yerkes Observatory in the late nineteenth century show an elongated red spot, occupying the same range of latitudes but with twice the longitudinal extension.

Sometimes, it is a strong red color, and really quite remarkable, and sometimes pales into insignificance. Historically, initially it was thought that the Great Red Spot was the top of a gigantic mountain or a plateau that went above the clouds. This idea was however discarded in the nineteenth century to be found to spectroscopically composition of hydrogen and helium in the atmosphere and it was determined that a fluid planet. The current size of the Red Spot is approximately two and half times that of the Earth. Meteorologically the Great Red Spot is a huge anticyclone very stable over time. The winds at the periphery of the vortex having an intensity close to 400 km / h.



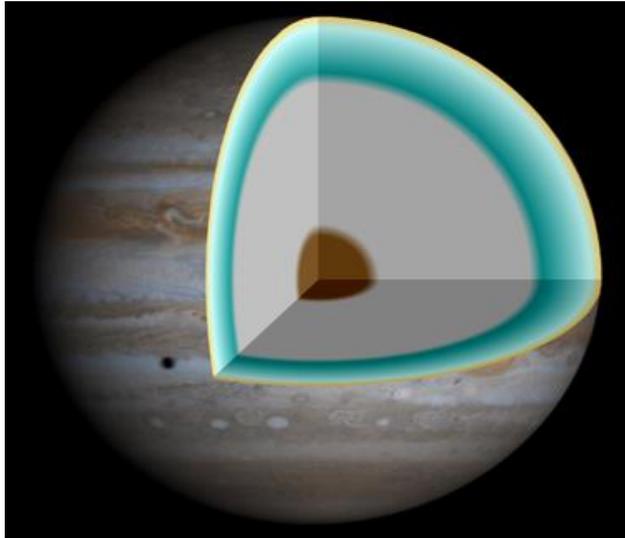
-High resolution image of the Great Red Spot on Jupiter taken by Voyager 1 in 1979

-Hubble Space Telescope image showing the two red spots on Jupiter



## Internal structure

Inside the planet hydrogen, helium and argon (inert gas that accumulates on the surface of Jupiter), is progressively compressed. Molecular hydrogen is compressed so that fluid is transformed into a metallic



character to depths of about 15,000 km relative to the surface. Below the existence of a rocky core consisting mainly ice cream and denser materials about seven Earth masses expected (although a recent model increases the mass of the core of this planet between 14 and 18 Earth masses, 8 and others think there can be no such core 9 further exists the possibility that the core is greater at first, but the convection currents of hot metallic hydrogen would have made him lose mass). The existence of the different layers is determined by the study of the planet gravitational potential measured by different spacecraft. If there is the inner core, prove the theory of planet formation from a disk of planetesimals. Jupiter is so massive that it has not yet released the heat accumulated in its formation and has, therefore, an important internal source of heat energy has been measured accurately and amounts to  $5.4 \text{ W / m}^2$ . This means that the planet's interior is effectively mixed at least until near the clouds of water at 5 bar level.

The same model mentioned earlier that gives greater weight to the planet's core, considers that it has an internal structure

consisting of concentric cylinders rotating at different equatorial -the speed (which are external) faster than the internal-, similarly the Sun; JUNO is expected that the mission which was launched in 2011 to determine its gravity measurements of the Jovian planet's internal structure.

## Compared to the earth

Jupiter is the much larger than Earth, and basically hydrogen compound solar system's largest planet. The table below compares offer the features of Jupiter with Earth.

DATA	JÚPITER	EARTH
Size: equatorial radius	71.492 Km.	6.378 km.
Mean distance from Sun	778.330.000 km.	149.600.000 km.
Minimum distance to Earth	591.000.000 km.	---
Maximum distance to Earth	965.000.000 km.	---
Siderial period	11 years	1 year
Rotation period	9 hours 55 minutes	23 hours 56 minutes
Inclination of equator to orbit	03° 12'	23° 27'
Orbital speed (km/s)	13	30
Rotational speed (km/s)	12,5720	0,4651
Scape velocity (km/s)	59,54	11,18
Diameter equatorial	142.984 km.	12.756 km.
Mass	318	1
Surface gravity	2,55	1
Mean surface temperature	-120° C	15° C
Known number of satellites	67	1
Albedo	0,52	0,367

## Formation of Jupiter

The theories of planet formation are of two types:

- training from an ice core with a mass about 10 times Earth's mass capable of attracting and accumulating gas nebula protosolar
- early formation by direct gravitational collapse as would be the case of a star.

Both models have very different models for general formation of the solar system and extrasolar planetary systems implications. In both cases, the models have difficulty explaining the size and total mass of the planet, its orbital distance of 5 AU, which suggests that Jupiter did not move substantially in the region of formation and chemical composition of its atmosphere, particularly noble gases, enriched with respect to the sun. The study of the internal structure of Jupiter, and in particular the presence or absence of an inner core would distinguish both.

The properties of the interior of the planet can be scanned remotely from gravitational perturbations detected by a nearby spacecraft.

There are now proposals for space missions for the next decade that could answer these questions.

### 3-References:

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