

Hubble's new portrait of Jupiter

A new Hubble Space Telescope view of Jupiter, taken on June 27, 2019, reveals the giant planet's trademark Great Red Spot, and a more intense colour palette in the clouds swirling in Jupiter's turbulent atmosphere than seen in previous years. The colours, and their changes, provide important clues to ongoing processes in Jupiter's atmosphere.

The bands are created by differences in the thickness and height of the ammonia ice clouds. The colourful bands, which flow in opposite directions at various latitudes, result from different atmospheric pressures. Lighter bands rise higher and have thicker clouds than the darker bands.

NASA and Space Telescope Science Institute in Baltimore released this new Hubble Space Telescope view of Jupiter on August 8, 2019. The telescope acquired the image on June 27. It's beautiful, isn't it? It's reminiscent of some spacecraft images. Space fans waiting for the launch of the James Webb Space Telescope – which will be the successor to the Hubble Space Telescope – will have to wait until 2021, but, in the meantime, Hubble's still got it!

Among the most striking features in the image are the rich colours of the clouds moving toward the Great Red Spot, a storm rolling counterclockwise between two bands of clouds. These two cloud bands, above and below the Great Red Spot, are moving in opposite directions. The red band above and to the right (northeast) of the Great Red Spot contains clouds moving westward and around the north of the giant tempest. The white clouds to the left (southwest) of the storm are moving eastward to the south of the spot.

All of Jupiter's colourful cloud bands in this image are confined to the north and south by jet streams that remain constant, even when the bands change colour. The bands are all separated by winds that can reach speeds of up to 644 kilometres per hour.

On the opposite side of the planet, the band of deep red colour northeast of the Great Red Spot and the bright white band to the southeast of it become much fainter. The swirling filaments seen around the outer edge of the red super storm are high-altitude clouds that are being pulled in and around it. The Great Red Spot is a towering structure shaped like a wedding cake, whose upper haze layer extends more than 5 kilometres higher than clouds in other areas. The gigantic structure, with a diameter slightly larger than Earth's, is a high-pressure wind system called an anticyclone that has been slowly downsizing since the 1800s. The reason for this change in size is still unknown.

A worm-shaped feature located below the Great Red Spot is a cyclone, a vortex around a low-pressure area with winds spinning in the opposite direction from the Red Spot. Researchers have observed cyclones with a wide variety of different appearances across the planet. The two white oval-shaped features are anticyclones, like small versions of the Great Red Spot.

Another interesting detail is the colour of the wide band at the equator. The bright orange colour may be a sign that deeper clouds are starting to clear out, emphasizing red particles in the overlying haze.

The new image was taken in visible light as part of the Outer Planets Atmospheres Legacy program, or OPAL. The program provides yearly Hubble global views of the outer planets to look for changes in their storms, winds and clouds.

Hubble's Wide Field Camera 3 observed Jupiter when the planet was 400 million miles from Earth, when Jupiter was near "opposition" or almost directly opposite the Sun in the sky.



New Hubble Space Telescope view of Jupiter, taken on June 27, 2019.



The Hubble Space Telescope as seen from the departing Space Shuttle Atlantis, flying STS-125, HST Servicing Mission 4.