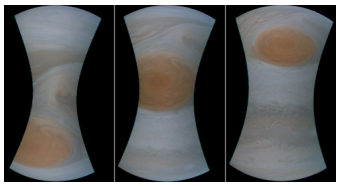

The raw images of Jupiter's Great Red Spot taken this week by the Juno probe. NASA/SwRI/MSSS

The images coming in from NASA's Juno mission reveal some amazing details of Jupiter's Great Red Spot, after the probe made its closest approach yet of the giant planetary storm system.

On Tuesday, Juno flew 9,000km above the most massive storm in our Solar System, thought to have been raging for centuries.

During the flyby the orientation of the spacecraft was optimised for radiometric observations, which probed the depth of the storm, so there was rather a limited window of opportunity for imaging of the central region of the cyclone.

Some of the images were taken by JunoCam, an optical camera dedicated to public outreach. At the closest approach to the planet, the camera can view features as small as 15km across, and it has taken some spectacular images of the Great Red Spot during the flyby.

The raw images from JunoCam are available for anyone to download , edit and enhance. People can then submit their images to a Juno gallery after some creative processing.

Citizen scientists

The images are amazing, and some citizen scientists have already been hard at work on them.

The enhanced red region in this image shows the ammonia clouds covering the central regions of the storm.

What we know so far about the Great Red Spot

The Great Red Spot is thought to have been raging on Jupiter for several centuries. The giant red feature on the planet was reported in the 17th century by scientists such as England's Robert Hooke and Italy's Eustachio Manfredi.

Images taken from space by NASA's Voyager 1 spacecraft in 1979 revealed the Great Red Spot as a swirling, layered oval of clouds moving in an anticlockwise direction across the Jovian surface along the banded streams of air.

Jupiter's Great Red Spot as seen by Voyager 1. NASA/JPL

Such a swirling pattern resembles anticyclones on Earth, when the strong winds flow outside and bend around the high-pressure air in the eye of the storm.

Cyclones die out quickly on Earth, usually when they hit land, due to friction with the planetary surface.

But Jupiter does not have a well-defined surface and its fast rotation – a Jovian day lasts only 9.9 Earth hours – makes any formed cyclones long lasting with ferocious winds blowing at close to 600kmh, almost twice as fast as the fastest cyclonic winds on Earth.

The Great Red Spot is exceptional both in its persistence and size – it exceeds two diameters of the Earth. In recent years, though, the Great Red Spot appears to be shrinking and changing its shape.

The storm is covered in the thick, cold clouds of ammonia elevated above the surrounding zonal clouds. Data from Galileo mission suggest the Great Red Spot resides in planetary troposphere and does not extend too high up into ionosphere.

The changing colour of the spot

Another puzzle about the Great Red Spot is its colouration, that changes over years from reddish to almost white hue that blends with the surrounding clouds of the icy ammonia.

An illustration of NASA’s Juno spacecraft in orbit above Jupiter’s Great Red Spot. NASA/JPL-Caltech

It is not clear what makes the spot red. Hydrocarbons, compounds of sulphur and phosphorus have been suggested to colour the clouds swirling in the storm. Their chemistry is being tested in laboratories with simulated Jovian conditions without much consensus so far.

One study suggests that particles of red phosphorus upwelling from deeper layers of the atmosphere above the Great Red Spot cannot produce the very intense red colour that was observed in the past.

The current favoured models suggest a layer of ammonium hydrosulfides that can turn reddish in ultraviolet light from the Sun under appropriate conditions.

Before the end of Juno mission we should have a much better understanding of compounds that play role in giving Jovian clouds their colour, while the latest approach to the Giant Red

Spot should help us to explain what powers this long lasting storm.

Lucyna Kedziora-Chudczer does not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond the academic appointment above.

Authors: Lucyna Kedziora-Chudczer, Postdoctoral Fellow, Astrophysics Researcher, UNSW

Read more http://theconversation.com/early-images-of-the-closest-look-at-jupiters-great-red-spot-80808