

Explained in 60 Seconds: *Juno* Surveys Jupiter's Great Red Spot and the Citizen-Led Approach to Imaging

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The *Juno* spacecraft is blazing a new trail in understanding Jupiter's atmosphere and magnetosphere (Daniels, 2016). *Juno* scientists have been keenly anticipating observations of Jupiter's Great Red Spot, a storm the size of two or three Earths that has been raging for over a century. *Juno* passed directly over the centre of Jupiter's Great Red Spot on 11 July 2017, only 9000 kilometres away from the tops of its clouds.

The highest-resolution image of the Great Red Spot has an unprecedented spatial scale of six kilometres per pixel. V-shaped lanes, darker in colour, mark peak velocities in the Great Red Spot's counterclockwise rotation, and smaller anti-clockwise vortices can also be seen. Near the centre of the spot are clusters of clouds 25–30 kilometres in size, reminiscent of terrestrial thunderstorms. Near the northern edge of the Great Red Spot, as the red colour blends into the whiter-coloured, slower-moving clouds, is a long series of linear features spaced about 70 kilometres from each other. This is the first evidence for small-scale atmospheric waves called Mesoscale Gravity Waves within the Great Red Spot. Gravity waves happen when the atmosphere gets disturbed. The force of gravity pulls the atmosphere back into equilibrium, but ripples are left behind. These ripples are gravity waves.

Although most of *Juno's* instruments collect data that need to be downloaded and processed by a science team before they can be made widely available, the results from *Juno's* public-outreach camera, JunoCam, became available to both the science team and the general public within a couple of days of the close approach and captured jaw-dropping moments. Originally intended only as a public-outreach instrument, JunoCam has no dedicated science-analysis team, but the images have proven to be very useful. In fact, astronomers are particularly grateful to talented members of the public who have processed the raw frames and care-



Figure 1. The highest-resolution colour-composite image of Jupiter's Great Red Spot by the JunoCam instrument. Credit: NASA/Southwest Research Institute/Malin Space Science Systems/Gerald Eichstädt, Seán Doran

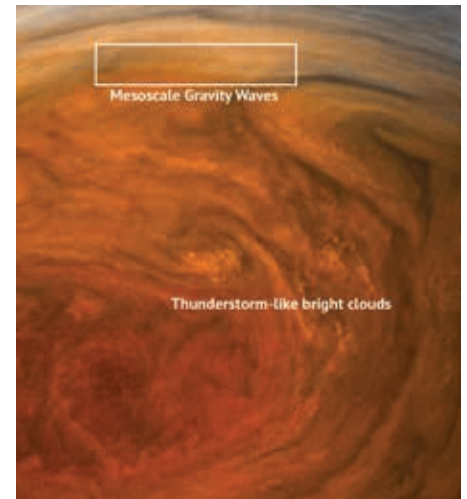


Figure 2. Close-up of the Great Red Spot showing the mesoscale gravity wave and thunderstorm-like bright clouds. Annotations courtesy of CAPjournal.

fully produced images that enhance features without introducing spurious processing effects. For example, the striking figure in this article was created by Gerald Eichstädt, a mathematician in Stuttgart, Germany, with enhancements by Seán Doran, a visual artist in London.

Soon, the information from JunoCam will be assembled along with *Juno's* other observations as well as results from a coordinated campaign of Earth-based supporting observations to extend and support *Juno's* results. Much is owed to the citizen-scientists who helped to track the location of the Great Red Spot and provided detailed processing of Juno's initial results.

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References

Daniels, Sebastian. CAPjournal 21, December 2016