

Celestial



Observer

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CCAS member Larry Vickman took this photo of the April 8th total solar eclipse from Upstate New York.

Stargazing: In person this Summer!

CCAS hosts star parties at Santa Margarita Lake Park every month (weather dependent). Come learn and enjoy the Summer sky, while the Milky Way shines bright!

Club Meeting: Thursday, July 18th at 7pm (in-person only)

July's meeting will feature CCAS Astrophotographers presenting about their preferred equipment and showing some of their favorite photos.

Find dates and more information about all of our events on our calendar:

CentralCoastAstronomy.org/Calendar

Central Coast Astronomical Society Events

In Person Star Parties at Santa Margarita Lake Park: Join other astronomers and night sky enthusiasts monthly at Santa Margarita Lake Park to mingle and view the night sky. Bring your own binoculars or telescope, or enjoy looking through others' equipment. These events are weather dependent, but are scheduled monthly on the weekend closest to the new moon (when possible), and in conjunction with certain holidays. For more information and best practices, visit:

www.CentralCoastAstronomy.org/calendar/category/in-person-star-party/

Upcoming Events (Arrive before sunset):

- Saturday, August 3rd
- Saturday, September 7th
- Saturday, October 5th

In Person Club Meetings: Held quarterly at the United Methodist Church in San Luis Obispo, meet other CCAS members and enjoy the guest speaker presentation on a wide range of topics surrounding astronomy and the cosmos. For dates and guest speaker details, visit:

www.CentralCoastAstronomy.org/calendar/category/in-person-club-meeting

Upcoming Events:

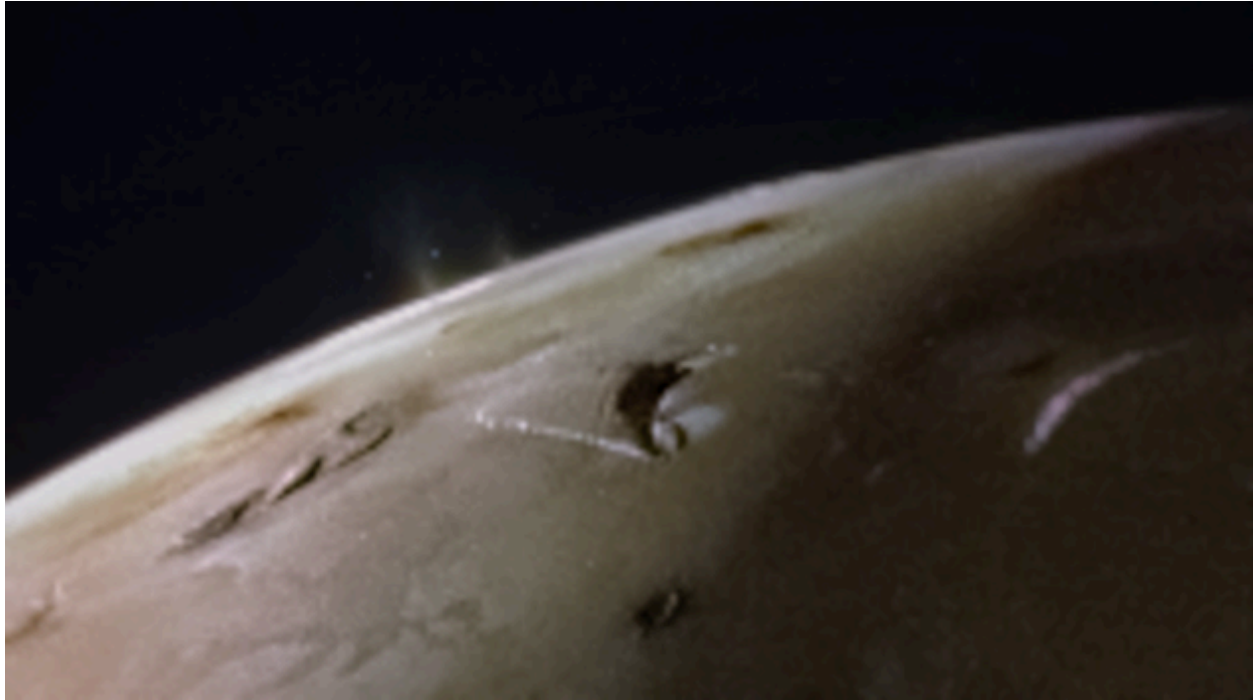
- Thursday, July 18th - 7:00pm - 9:00pm
- Thursday, October 17th - 7:00pm - 9:00pm

Visit our YouTube channel: Did you know that Central Coast Astronomical Society has a YouTube channel that has virtual stargazing videos for every month of the year, lectures, astronomy tutorials and more? Further your learning by visiting our channel and watching educational videos any time you'd like!

www.YouTube.com/@CentralCoastAstronomy

NASA's Juno Gets a Close-Up Look at Lava Lakes on Jupiter's Moon Io

by NASA JPL



The JunoCam instrument aboard NASA's Juno spacecraft captured two volcanic plumes rising above the horizon of Jupiter's moon Io. The image was taken Feb. 3 from a distance of about 2,400 miles (3,800 kilometers). Credit: Image data: NASA/JPL-Caltech/SwRI/MSSS Image processing by Andrea Luck (CC BY)

Infrared imagery from the solar-powered spacecraft heats up the discussion on the inner workings of Jupiter's hottest moon.

New findings from NASA's Juno probe provide a fuller picture of how widespread the lava lakes are on Jupiter's moon Io and include first-time insights into the volcanic processes at work there. These results come courtesy of Juno's Jovian Infrared Auroral Mapper (JIRAM) instrument, contributed by the Italian Space Agency, which "sees" in infrared light. Researchers published a paper on

Juno's most recent volcanic discoveries on June 20 in the journal *Nature Communications Earth and Environment*.

Io has intrigued the astronomers since 1610, when Galileo Galilei first discovered the Jovian moon, which is slightly larger than Earth's Moon. Some 369 years later, NASA's Voyager 1 spacecraft captured a volcanic eruption on the moon. Subsequent missions to Jupiter, with more Io flybys, discovered additional plumes — along with lava lakes. Scientists now believe Io, which is

stretched and squeezed like an accordion by neighboring moons and massive Jupiter itself, is the most volcanically active world in the solar system. But while there are many theories on the types of volcanic eruptions across the surface of the moon, little supporting data exists.

In both May and October 2023, Juno flew by Io, coming within about 21,700 miles (35,000 kilometers) and 8,100 miles (13,000 kilometers), respectively. Among Juno's instruments getting a good look at the beguiling moon was JIRAM.

Designed to capture the infrared light (which is not visible to the human eye) emerging from deep inside Jupiter, JIRAM probes the weather layer down to 30 to 45 miles (50 to 70 kilometers) below the gas giant's cloud tops. But during Juno's extended mission, the mission team has also used the instrument to study the moons Io, Europa, Ganymede, and Callisto. The JIRAM Io imagery showed the presence of bright rings surrounding the floors of numerous hot spots.

"The high spatial resolution of JIRAM's infrared images, combined with the favorable position of Juno during the flybys, revealed that the whole surface of Io is covered by lava lakes contained in caldera-like features," said Alessandro Mura, a Juno co-investigator from the National Institute for Astrophysics in Rome. "In the region of Io's surface in which we have the most complete data, we estimate about 3% of it is covered by

one of these molten lava lakes." (A caldera is a large depression formed when a volcano erupts and collapses.)

Fire-Breathing Lakes

JIRAM's Io flyby data not only highlights the moon's abundant lava reserves, but also provides a glimpse of what may be going on below the surface. Infrared images of several Io lava lakes show a thin circle of lava at the border, between the central crust that covers most of the lava lake and the lake's walls. Recycling of melt is implied by the lack of lava flows on and beyond the rim of the lake, indicating that there is a balance between melt that has erupted into the lava lakes and melt that is circulated back into the subsurface system.

"We now have an idea of what is the most frequent type of volcanism on Io: enormous lakes of lava where magma goes up and down," said Mura. "The lava crust is forced to break against the walls of the lake, forming the typical lava ring seen in Hawaiian lava lakes. The walls are likely hundreds of meters high, which explains why magma is generally not observed spilling out of the paterae" — bowl-shaped features created by volcanism — "and moving across the moon's surface."

JIRAM data suggests that most of the surface of these Io hot spots is composed of a rocky crust that moves up and down cyclically as one contiguous surface due to the central upwelling of magma. In this

hypothesis, because the crust touches the lake's walls, friction keeps it from sliding, causing it to deform and eventually break, exposing lava just below the surface.

An alternative hypothesis remains in play: Magma is welling up in the middle of the lake, spreading out and forming a crust that sinks along the rim of the lake, exposing lava.

“We are just starting to wade into the JIRAM results from the close flybys of Io in December 2023 and February 2024,” said Scott Bolton, principal investigator for Juno at the Southwest Research Institute in San Antonio. “The observations show fascinating new information on Io’s volcanic processes. Combining these new results with Juno’s longer-term campaign to monitor and map the volcanoes on Io’s never-before-seen north and south poles, JIRAM is turning out to be one of the most valuable tools to learn how this tortured world works.”

Juno executed its 62nd flyby of Jupiter — which included an Io flyby at an altitude of about 18,175 miles (29,250 kilometers) — on June 13. The 63rd flyby of the gas giant is scheduled for July 16.

More About the Mission

NASA’s Jet Propulsion Laboratory, a division of Caltech in Pasadena, California, manages the Juno mission for the principal investigator, Scott Bolton, of the Southwest Research Institute in San Antonio. Juno is part of NASA’s New Frontiers Program, which is managed at NASA’s Marshall Space Flight Center in Huntsville, Alabama, for the agency’s Science Mission Directorate in Washington. The Italian Space Agency (ASI) funded the Jovian InfraRed Auroral Mapper. Lockheed Martin Space in Denver built and operates the spacecraft.

More information about Juno is available at:

[Science.nasa.gov/mission/juno](https://science.nasa.gov/mission/juno)

CCAS Contacts

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Vice President Tom Frey
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Communication Brian P. Cox

CCAS Information

Founded in 1979, the Central Coast Astronomical Society (CCAS) is an association of people who share a common interest in astronomy and related sciences.

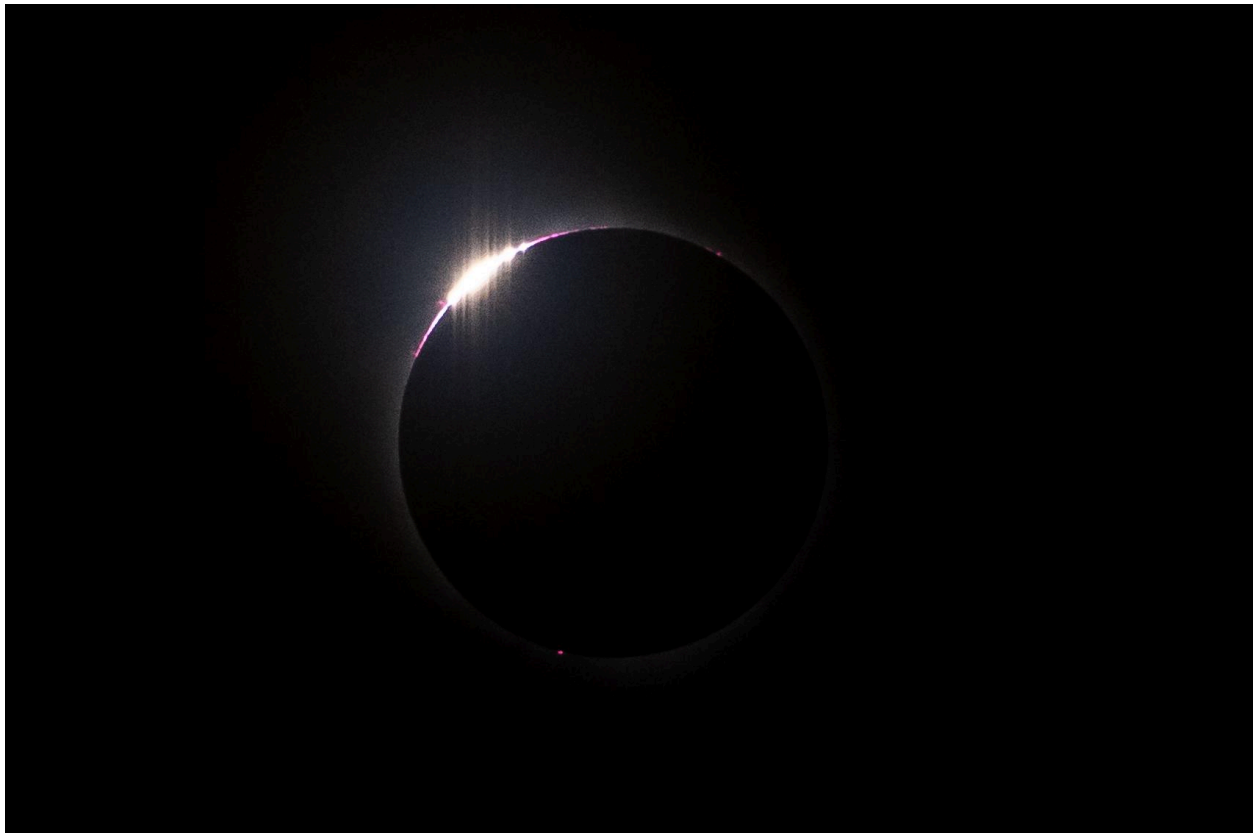
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Another photo by Larry Vickman shows the solar eclipse just moments before totality, showing off its "diamond ring".