



VOL. 105 | NO. 10
OCTOBER 2024

EOS

SCIENCE NEWS BY AGU

Ukrainian Scientists Race
to Document Soil Fungi

Earth's First Evidence of Fresh Water

Mosquitoes Without Borders

LAND OF THE **Long White Cloud** AND THE **Deep Blue Sea**

Innovative geoscience projects are documenting
Aotearoa New Zealand's deep history—
and far-reaching future—on land and sea.

AGU
ADVANCING EARTH
AND SPACE SCIENCES

Supersharp Images Reveal Scars of Major Eruption on Io



A new instrument installed at the Large Binocular Telescope in Arizona enables researchers to observe worlds in our solar system in exquisite detail. Credit: Large Binocular Telescope Observatory

Of all known volcanically active worlds in our solar system—including Earth and some moons of Jupiter, Saturn, and Neptune—the Jovian moon Io is the most restless. Its surface boasts active lava flows, bubbling lakes of molten lava, and more than 400 volcanoes.



SHARK-VIS captured this image of Jupiter's moon Io—the highest-resolution image of Io ever obtained by an Earth-based telescope—on 10 January 2024. Credit: INAF/Large Binocular Telescope Observatory/Georgia State University; IRV-band observations by SHARK-VIS/F. Pedichini; processing by D. Hope, S. Jefferies, G. Li Causi

Now, *Conrad et al.* present the highest-resolution images of Io ever captured by an Earth-based instrument. These visible-wavelength snapshots reveal surface features that hint at a recent powerful eruption on the moon and demonstrate the capability of new technology to dramatically enhance monitoring of Io and other worlds in the solar system.

The technology in question, SHARK-VIS, is a new high-contrast optical imaging instrument installed last year on the Large Binocular Telescope (LBT) on Mount Graham in Arizona. SHARK-VIS (System for High Contrast and Coronagraphy from R to K at Visual Bands) mitigates the blurring caused by Earth's atmospheric turbulence, yielding images that, after postprocessing with the image restoration software Kraken, exhibit resolution 3 times that of visible light images obtained by the Hubble Space Telescope. Previously, only spacecraft or Hubble could capture visible light images of Io. But the LBT can now capture features on Io's surface smaller than about 80 kilometers across—comparable to taking a picture of a dime-sized object from 100 miles away.

After SHARK-VIS was installed, researchers used the telescope to observe Io in

November 2023 and January 2024. Looking closely at the images, they noticed something curious: A well-known, red-hued, annular ring of deposits from a continuously erupting volcano called Pele appeared to have been partially covered by other multicolored deposits.

By cross-referencing this information with data previously captured by other instruments, the researchers concluded that they were most likely looking at the aftermath of a large 2021 eruption of a nearby volcano called Pillan Patera.

Similar resurfacing events might be commonplace on Io. But with spacecraft visits to the moon being few and far between and only low-resolution images previously offered by Earth-based telescopes, researchers have had scant opportunities to detect them.

SHARK-VIS will help scientists closely monitor Io's surface for years to come, allowing a deeper understanding of the moon's dynamic volcanism. The technology should also enable high-resolution images of bodies throughout the solar system, including other moons, planets, and asteroids. (*Geophysical Research Letters*, <https://doi.org/10.1029/2024GL108609>, 2024) —Sarah Stanley, *Science Writer*