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# Jupiter's Europa Helps Earthlings See Sister Moon's Volcano

The enormous volcano Loki Patera dwarfs anything on Earth yet resides on tiny Jovian moon Io. Astronomers now report taking advantage of a chance alignment—the neighboring moon Europa passing in front of Io, as seen from Earth—to scrutinize the volcano and its huge lava lake with 40 times greater spatial detail than in past observations.

These highest-resolution images of Loki ever recorded from Earth may aid scientists to better answer questions about how this mysterious 200-kilometer-wide horseshoe-shaped lava feature formed and evolves.

## Fortuitous Occultation

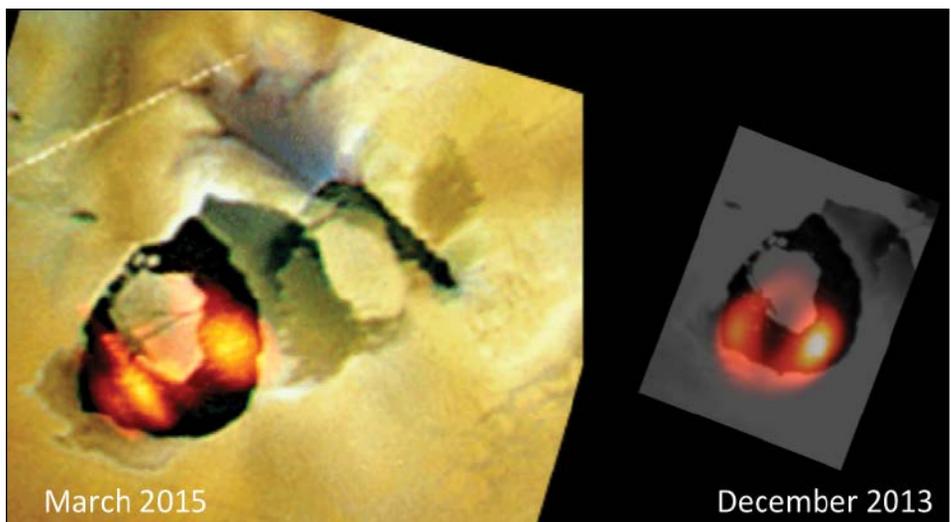
Michael Skrutskie of the University of Virginia in Charlottesville and his colleagues were already set to examine Loki Patera last March with the Large Binocular Telescope, located in southeast Arizona, when they realized that a chance occultation by Io's neighbor could dramatically enhance the observations. They then adjusted the timing of their observations to take full advantage of Europa's temporary interposition.

During the first part of the occultation, known as the ingress, Europa progressively blocked larger regions of Loki Patera from view. Between successive telescope images, Europa cloaked about 2 additional kilometers of the volcano. The reverse occurred during egress, when Europa receded. By reducing the amount of Loki visible at any moment, Europa's passage between Earth and Io allowed the telescope to discern finer features of the volcanic terrain than it did in 2013, when Europa's assist was not available, Skrutskie said.

He described the findings on 12 November 2015 at the annual meeting of the American Astronomical Society's Division for Planetary Sciences in National Harbor, Md.

## Shifting Hot Spots

The images reveal that the hot spots within Loki Patera have shifted position since 2013. As Skrutskie and his colleagues analyze more of the data, they may be able to make detailed temperature maps of the volcano, which could test models of how the hot spots develop, study collaborator Ashley Davies of NASA's Jet Propulsion Laboratory in Pasadena, Calif., told *Eos*.



A new view (left) of the Loki Patera volcanic depression on Jupiter's moon Io reveals that hot spots in the volcano (red blobs with yellow centers) have shifted since the much lower resolution image (right) was captured in 2013. Each of these views of Loki overlays a 1970s visible light image of Io's surface onto a much newer infrared image from the Large Binocular Telescope (fiery-looking features in shades of red and yellow).

In one model, Davies noted, blocks of crust form on the surface of the lava lake created by the volcano. As a block thickens and cools, it becomes less buoyant and finally sinks down to the bottom of the lake. Researchers suggest that these blocks of crust sink successively in a counterclockwise direction around an island in the middle of Loki Patera, taking about 1.5 Earth years to go completely around. The process should generate a systematic temperature distribution across Loki Patera, which may be apparent in the high-resolution data, Davies said.

"Loki Patera is one of the great wonders of the solar system," and the new observations "may give us

the nuts and bolts of how this massive volcano works," he said.

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