High Resolution Imaging of Io's Volcanoes with LBTI

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We report new findings in the on-going study of volcanic processes at Loki Patera on Io. From images acquired with the Large Binocular Telescope Interferometer (LBTI) on December 24th, 2013, we detected a strong M-band emission feature at Loki Patera. Using the high resolution Fizeau mode of LBTI, we measured its size, its irregular shape, and its position with respect to Loki’s horse-shoe lava lake. We detected and measured locations for 16 additional hot spots, including two enigmatic sources in Colchis Regio.

Abstract

Volcanoes on Io are best studied in the 3-5 micron wavelength regime. Thermal emission (150-1500K) maximizes the fraction of flux coming from thermal emission, while still being sensitive to the hottest (1500+K) eruptions. We therefore observe Io within the atmospheric windows at either 3.8 or 4.7um (L’- or M-band), using the highest resolution available from the ground.

But what is the highest resolution possible from ground-based observatories?

We show here Large Binocular Telescope (LBT) images of Io. LBT provides a factor of two improvement in resolution over what has previously been possible.

The M-band images of Io shown in figure 1 provide resolution down to approx. 100 km on Io's surface. In the image of Io shown in figure 1 we see that the large emission region at Loki Patera is resolved.

To what level is Loki resolved?

The possibility that we were seeing two distinct emission regions, with a “hollow middle,” was first noticed in the MRL result. This was confirmed via 1-D model fits.

What can we learn from this data about the horseshoe lava lake?

Although our analysis of this data continues, we can show here our current knowledge of the location and emission pattern. Based on good agreement of our locations (of known volcanoes) with what appears in the literature, we overlaid our detected Loki feature with this spacecraft image of the lava lake. One portion appears to emanate from the island, while the other lies on the lake itself.

References

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