Observations of Jupiter' moon Io by Juno/JIRAM.

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Abstract The Jovian Infrared Auroral Mapper (JIRAM [1]) onboard the NASA Juno spacecraft [2] is a dual-band imager and spectrometer. The imager channel is a single detector with 2D capability and with 2 different filters (L band, from 3.3 to 3.6 μm; M band, from 4.5 to 5 μm); the spectrometer is a 1-D detector with a spectral resolution of 9 nm in the range 2 - 5 μm. JIRAM's main objective is the study of the Jovian atmosphere and aurorae.

In addition to these primary goals, JIRAM has been used to obtain images and spectra of the Galilean satellites, Jupiter's major moons. In fact, the M-band filter is suitable for mapping the thermal structures of the surface; the other (L-band) can be used to determine the surface albedo. The pixel angular resolution (0.01°) is fine enough for imaging the moons from the polar, highly elliptical orbit of Juno; the spatial resolution at the surface of Io varies along the s/c distance and is of the order of 100 km/pixel or even finer.

On Dec. 16th, 2017, at 23:45 UTC, JIRAM started to collect images and spectra of Io from a distance of 470,000 km. The sub-spacecraft point on Io was at 77° South. The instrument took 80 images and 80 spectra of the south pole of Io. The observation lasted 40 minutes. Infrared images in the M band have been superimposed in order to increase the spatial resolution (figure 1).

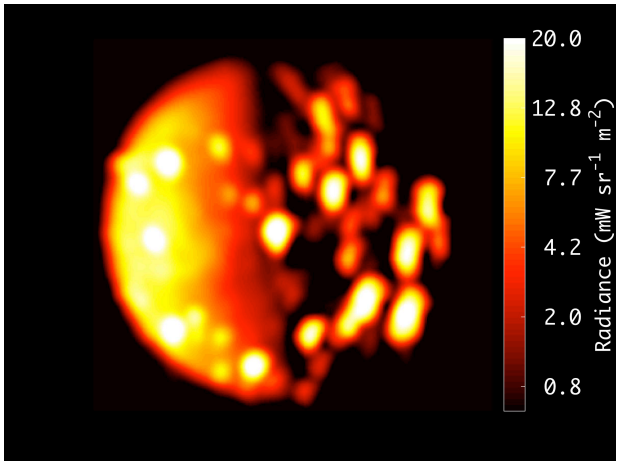

Figure 1: The southern hemisphere of Io as seen by JIRAM on Dec. 16th, 2017. Radiance is integrated in the M band (4.5-5 μm).

These observations allowed characterization of the location and morphology of Io's hot spots, SO_2 frost distribution, and the temperature of selected locations on the surface. A possible new hot spot/volcano is identified close to the South Pole. The images of this region also show significant variations of the hot spot morphology, possibly due to lava flows. One year later, JIRAM was able to observe Io from a closer distance and during an eclipse by Jupiter.
In this study, we present a summary of JIRAM's images, spectra and JIRAM-derived maps of Io.

References:

[1] Adriani, A., et al. (2014), JIRAM, the Jovian infrared Auroral Mapper, Space Sci. Rev., doi:10.1007/s11214-014-0094-y.

[2] Bolton, S.J., et al. (2017), The Juno Mission, Space Science Reviews, 213, 5-37, doi:10.1007/s11214-017-0429-6.