

LOCATIONS, TEMPERATURES AND AREAS OF IO'S HOT SPOTS FROM
MULTI-COLOR INFRARED PHOTOMETRY OF OCCULTATIONS

J. GOGUEN, D. Matson, (JPL, Pasadena, CA 91109), W. Sinton (Inst. for Astronomy, Univ. of Hawaii, Honolulu, HI 96822), R. Howell, M. Dyck (Univ. of Wyoming, Laramie, WY 82071), G. Veeder, T. Johnson, R. Nelson, A. Lane (JPL, Pasadena CA 91109) and R. McLaren (CFHT, Kamuela, HI 96796)

During 1985, the earth passed through the orbital plane of the Galilean satellites and occultations of Io by J3 and J4 presented rare opportunities to determine the precise locations and physical characteristics of Io's hot spots. Measurements were made of the total flux from both Io and the occulting satellite at 0.1 second time resolution in one or more bandpasses centered at 0.7, 3.8, 4.8 and 8.7 micrometers wavelength. As Io is occulted, the flux decreases smoothly; when a significant thermal anomaly is occulted, the flux drops suddenly producing a "step" in the flux vs. time plot. Upon reappearance, a step of increasing flux occurs. The relative positions of the two satellites and times of disappearance and reappearance determine the hot spot latitude and longitude. The thermal anomaly flux (amplitude of the step) in two or more bandpasses determines the hot spot color temperature and area. The high spatial resolution attained, about 10 kilometers along the direction of the relative satellite motion where this is perpendicular to the occulting satellite limb, allows the sizes of larger hot spots to be measured directly from the event duration and upper limits to be estimated on the sizes of the smaller hot spots. When only one wavelength was successfully observed, such direct measurements of hot spot size allow a brightness temperature to be calculated from the flux alone. Where multiple wavelengths are available, independent estimates of brightness and color temperatures are mutually consistent. In addition to direct measurements of active hot spots, the data contains upper limits on the flux emitted from the hot spots detected by Voyager and precise astrometry of relative satellite positions.

At least one of IRTF, UKIRT, CFHT and UH 2.2 and 0.6 m telescopes obtained useful data on 6/7, 6/10, 7/10, 11/29, 12/24 and 12/25 UT from Mauna Kea, Hawaii and the AAT contributed two events on 7/26 and 7/27 UT from Australia. A spatially resolved occultation of Loki at 3.8 micrometers on 12/25 UT will be shown. A new, small, high-temperature hot spot on Io's leading hemisphere was detected at 3.8 and 4.8 micrometers on 7/10 UT.