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HIGH-RESOLUTION INFRARED IMAGES OF TITAN USING SPECKLE INTERFEROMETRY WITH THE KECK TELESCOPE

D. GAVEL, S. Gibbard, B. Macintosh and C. Max (Lawrence Livermore National Laboratory)
I. de Pater (University of California, Berkeley)
A. Ghez (University of California, Los Angeles)

We used the facility near-infrared camera (NIRC) in speckle mode on the 10-meter W.M. Keck Telescope to observe Titan's surface through its atmospheric windows in H (1.49-1.82 μm) and K' (1.96-2.29 μm) bands. The speckle interferometry technique provides a means of achieving high resolution images from ground-based telescopes. At Keck, the speckle technique achieved spatial resolution near the diffraction limit of the Keck 10-meter aperture, which is 0.05 arcseconds or approximately 300 km on the surface of Titan. With two nights of imaging (June 27 and September 6, 1996) we have been able to form maps over two hemispheres of Titan, corresponding roughly to the greatest western elongation and the greatest eastern elongation faces. The contrast ratio (ratio of flux from lightest to darkest surface regions) approaches 30% in the K band images. From these images it is clear that the brightest surface features lie on the leading (greatest eastern elongation) side, which is consistent with HST maps at shorter wavelengths. The atmospheric limb brightening in these windows, which partially probe the atmosphere as well as the surface, is most prominent in the southern hemisphere. Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract number W-7405-ENG-48.