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RINGS OF URANUS

M. R. Showalter, SETI Institute; and J. J. Lissauer, Ames Research Center, NASA, report the discovery of two rings of Uranus, R/2003 U 1 and R/2003 U 2. Both are faint, dusty rings orbiting well beyond Uranus' previously known ring system. R/2003 U 1 peaks in brightness at 97700 km from the center of Uranus, coinciding with the orbit of Uranus XXVI (Mab), which is almost certainly the ring's primary source body. The ring has a broad triangular profile, with an inner limit at 86000 km — near the orbit of Uranus XV (Puck) — and an outer limit at 103000 km. R/2003 U 2 peaks in brightness at 67300 km, where no known moons are present. This ring also has a triangular profile, terminating near the orbits of Uranus XII (Portia) on the inside and Uranus XIII (Rosalind) on the outside. The rings are visible in data from the High Resolution Channel of the Hubble Space Telescope (HST) Advanced Camera for Surveys. They appear in 250-s clear-filter (300–700 nm) images obtained on 2003 Aug. 25 (24 images), 2004 Aug. 20 (40 images), 2004 Aug. 26 (40 images) and 2005 Aug. 20 (18 images). When images from a single date are co-added, $S/N > 10$. Both rings vary in brightness with the opening angle, as is expected for optically thin rings. R/2003 U 1 has a peak reflectivity at opposition (times the sine of the opening angle) of 9×10^{-7} and an estimated normal optical depth of 9×10^{-6}. R/2003 U 2 has a peak of 4×10^{-7} and an estimated normal optical depth of 6×10^{-6}.

I. de Pater, University of California at Berkeley; H. B. Hammel, Space Science Institute; and S. Gibbard, Lawrence Livermore National Laboratory, write: "We report the detection of a faint uranian ring at a distance of $\sim$ 67700 km from Uranus (outside the ϵ ring). We identify this ring as the first ground-based detection of R/2003 U 2, reported by Showalter and Lissauer above. We obtained the images at K' band (2.2 μm) on 2005 Aug. 23 UT with the 10-m Keck II Telescope (+ NIRC2/AO) on Mauna Kea. The small ring opening angle ($\sim 8^{\circ}.4$) and small phase angle ($0^{\circ}.4$, close to opposition), along with a full hour of integration time, combined to make this faint ring detectable. We also made a probable detection of this same ring in Oct. 2005, but the ring opening and phase angles were less favorable. We searched out to 115000 km from Uranus in Oct. 2005 and saw no additional rings. This will establish upper limits on the 2-μm brightness of any material out to that distance, including R/2003 U 1 reported by Showalter and Lissauer from HST data."

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