EXPLORING THE 18-20 MICRON WINDOW IN TITAN’S ATMOSPHERE: ROTATIONAL AND TIME VARIABILITY

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Observations of Titan’s flux relative to Saturn were made in an effort to explore the rotational and time variability in the 12–18 \( \mu \)m range, with the 18-\( \mu \)m region expected to be sensitive to the opacity of tropospheric (CH\(_4\)) clouds and surface properties, according to standard models. The observations were taken at NASA’s Infrared Telescope Facility using the MIRLIN and MIRSI mid-infrared imaging instruments. Observations were made using discrete filters centered at 17.2, 17.9, and 18.5 \( \mu \)m, with the latter predicted to be most sensitive to surface temperature and emissivity and to tropospheric cloud opacity. The diffraction limits at these long wavelengths precluded any meaningful spatial resolution. Observations were also made of (i) 12.2-\( \mu \)m stratospheric C\(_2\)H\(_6\) emission as a control, and (ii) 1.58–2.27 \( \mu \)m near-infrared reflectivity for correlations with known time and rotational variability. Observations were made with MIRLIN on 2002 Feb 7–13 and 2003 Feb 23 - Mar 1, and with MIRSI on 2003 Oct 28–29, Dec 16–18; 2004 Feb 5–8, and Mar 22–24. At 18 \( \mu \)m, a marginal 20% rise is detected from observations at sub-earth longitudes near 100\(^\circ\) to longitudes near 300\(^\circ\). At 17.2 and 17.9 \( \mu \)m, there is evidence for interannual variability unrelated to rotational phase. Neither effect is seen for 12.2 \( \mu \)m which is constant to within a 1-\( \sigma \) range of \( \sim \)8%. There are no obvious correlations with near-infrared reflectivity. The direct implications of the data point toward a differentiable surface vs tropospheric cloud variability by the Cassini CIRS instrument.

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