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# Spatial Variability in the Stratosphere of Uranus

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Observations of spatial variability in the atmosphere of Uranus have been limited to cloud properties and temperatures in the troposphere from a combination of spacecraft and ground-based observations. We report observations of the spatial distribution of (1) the stratospheric temperature field and (2) the distribution of stratospheric acetylene from ground-based mid-infrared observations using giant telescopes that resolve the planet spatially. (1) Temperatures in the stratosphere were derived from spectral scanning of the $H_2$ rotational S(1) quadrupole using the TEXES spectrometer at the Gemini North observatory in 2007, near Uranus' equinox at high resolution (R=55,000). The $H_2$ S(1) line was mapped by scanning the slit longitudinally across the entire disk of the planet. The observed radiances from the line center emerge primarily from the 0.1-0.3mbar pressure level. As expected for the "thermally inverted" stratosphere, the planet is limb brightened at all latitudes, generally consistent with the predictions for the temperature structure derived from Spitzer IRS disk-averaged spectra (Orton et al. 2014 Icarus 243, 494). A cut through the central meridian shows a generally smooth variability, with the (IAU-defined) northern hemisphere emerging from winter darkness marginally brighter than the southern hemisphere, consistent with a smooth meridional gradient of temperatures. A cut across the equator reveals an ostensible central brightening, as well as equal brightening toward the limbs. (2) The distribution of $C_2H_2$ in the stratosphere was derived from images of thermal emission made in 2009 using the mid-infrared imager/spectrometers VISIR at the Very Large Telescope and T-ReCS at the Gemini South Observatory using a 13.04-$\mu$m moderate-band (NeII_2) filter. Because the continuum in this spectral region is so faint, the upwelling radiation is dominated by acetylene emission from roughly the same pressure level at the radiation from the $H_2$ S(2) quadrupole line. Although the general center-to-limb structure is consistent with predictions from the $C_2H_2$ distribution derived from the low-eddy-diffusion rate models fitting the Spitzer IRS data (Orton et al. 2014 Icarus 243, 471), there is a strong bifurcation between a lower-latitude, low-radiance region and higher-latitude high-radiance region with a distinct boundary near $\sim 25^{\circ}$ latitude from the equator in both northern and southern hemispheres. Given the apparent smooth meridional variability of temperature, this implies a distinct boundary of higher vs. lower $C_2H_2$ abundance regions that is most likely to be maintained dynamically.