Geophysical Research Abstracts, Vol. 9, 07229, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07229

Near infrared observations of the latitudinal variation of vertical cloud structure in Uranus' atmosphere

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Uranus is approaching its northern spring equinox in December 2007. At the planet's last equinox in 1965, there were indications of a substantial change in the planet's appearance with rapid changes in cloud cover. Ground-based instrumentation has improved dramatically since 1965 and hence there is great international interest in monitoring the cloud structure of Uranus through this equinox period to monitor any rapid variation in the planet's atmosphere that may occur this time.

New near-infrared spectra of Uranus were observed in August/September 2006 using the UIST instrument on the United Kingdom Infrared Telescope (UKIRT). Spectra were recorded with the instrument in Long Slit mode, with the slit aligned with the planet's central meridian to determine the North-South variations of Uranus' cloud structure. Spectra were recorded between 1 and 3 microns at a resolving power varying between 550 and 2000. In addition to these spectra, context images were also recorded at a number of wavelengths to note the position of discrete mid-latitude clouds on Uranus to ensure that the spectral signature of these was not confused with any general North-South trends. The last time the complete near-IR spectrum of Uranus was observed was in 1975, and then only disc-integrated spectra could be observed. Hence, these appear to be the first latitudinally resolved complete near-IR spectra of Uranus ever recorded.

We here present initial studies of the latitudunal variation of Uranus' vertical cloud structure from these data. In the 1.3 and 1.6 micron windows a clear North-South asymmetry is observed in the raw observations, with a clear increase in albedo seen at northern mid-latitudes. However, an unexpected discovery is that the 1.06 micron peak shows the same clear N-S asymmetry on the shortwave side of the peak at 1.05

microns, but complete symmetry on the longwave side at 1.08 microns, at wavelengths of very similar overall albedo. We will here present retrievals of the vertical cloud structure from these data using the new methane absorption coefficients of Irwin et al. (2006) and a Matrix Operator multiple scattering model. With this analysis we hope to place new constraints on the North-South variation of the vertical cloud structure at this time, immediately prior to Uranus' equinox.