Near-Infrared Spectral Monitoring of Triton with IRTF/SpeX

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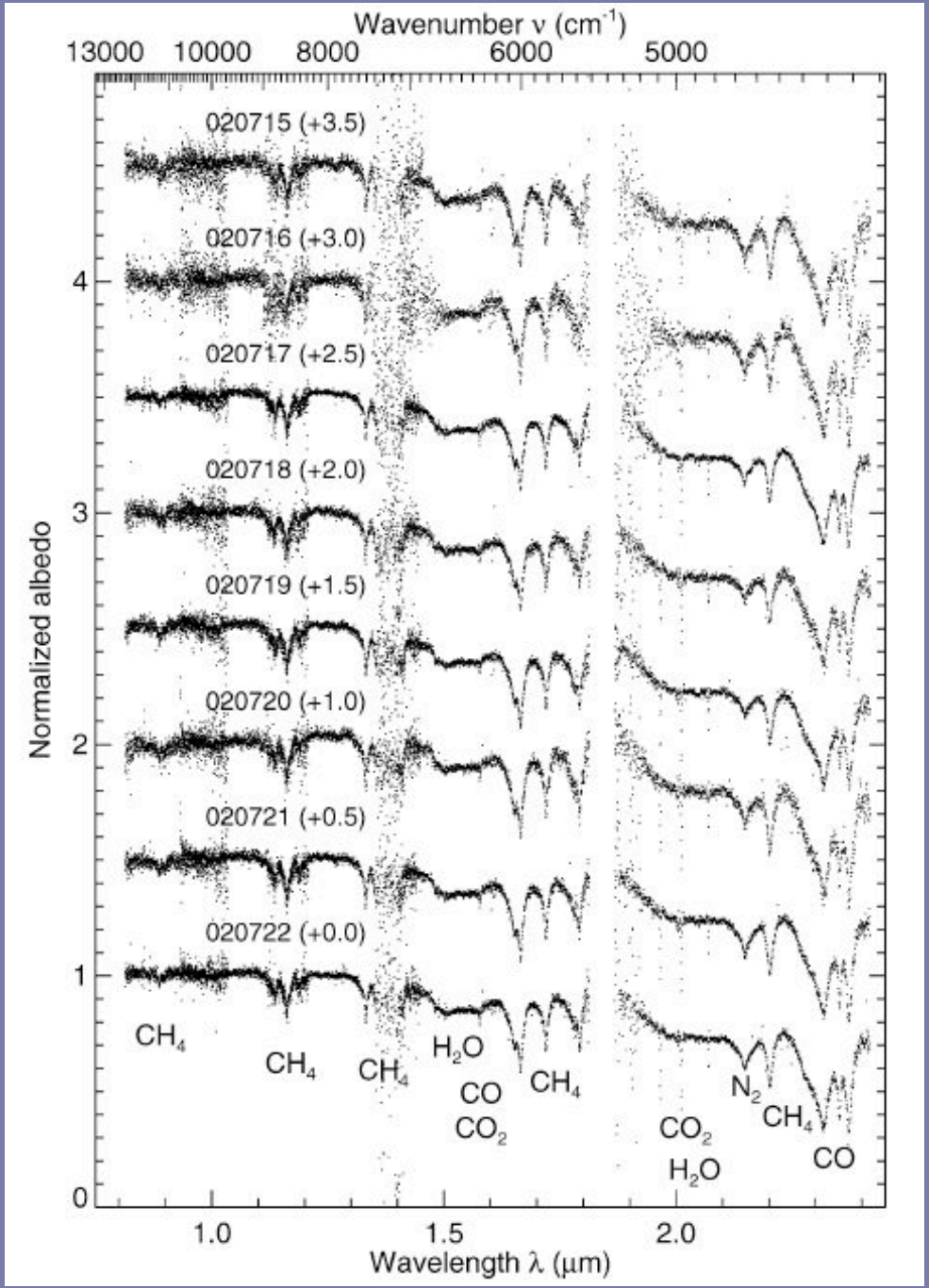
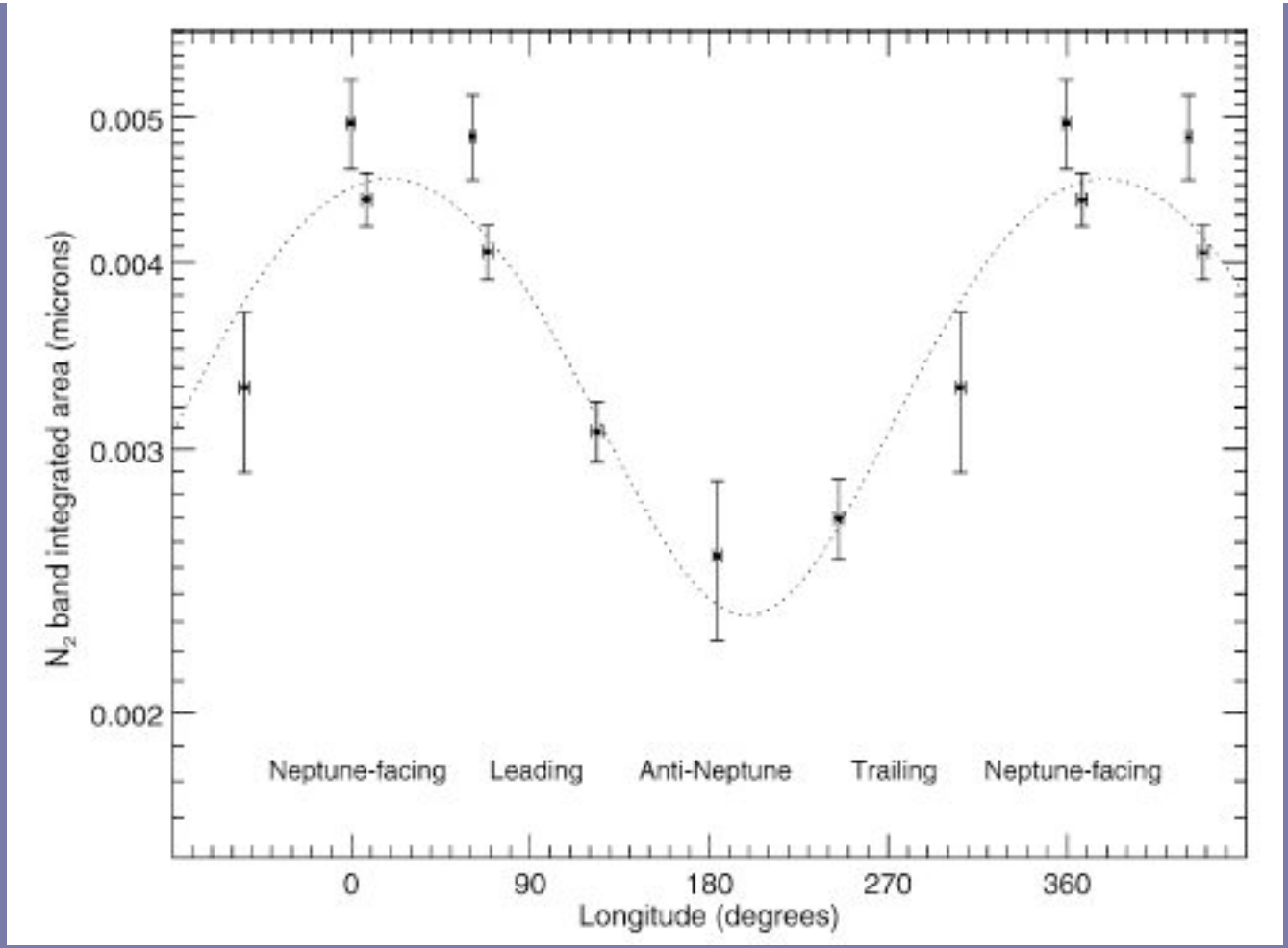
Neptune's moon, Triton, experiences complex seasonal variations in its subsolar latitude due to the combination of Neptune's obliquity and Triton's inclined orbit.

0.8-2.4 micron spectral observations Triton were obtained using SpeX on eight consecutive nights during 15-22 July 2002. These observations revealed periodic variations in the strengths of the absorptions bands of the surface ices N_2, CH_4, and H_2O for the first time.

The variations in N_2 were the largest-- about a factor to two as shown in the next figures.



Spectra obtained on eight consecutive nights during 15-22 July 2002. These were normalized at 1.0 micron and offset upward by the amounts shown in parentheses. Absorption bands of surface ices are indicated at the bottom of the plot.



Integrated area of Triton's N2 ice absorption band at 2.15 μm, as a function of subsolar/sub-Earth longitude, showing a large cyclical variation. Five data points are re-plotted outside the 0° to 360° interval to clarify the periodic trend. A sinusoidal fit to the data (dotted curve) has its maximum at 19° longitude. Much smaller variations were found for CH_4 and H_20 but not for CO_2.

N_2 shows twice as much absorption on Triton's Neptune-facing hemisphere. Comparison of maps of Triton's spectral units made from Voyager data suggest that Triton's observed N_2 ice is concentrated on low-latitude regions of Triton's polar cap, which are predominantly located on the Neptune-facing hemisphere.

Non-volatile H_2O ice seems to be slightly concentrated on Triton's leading hemisphere while Triton's CH_4 ice seems to be slightly concentrated on the trailing hemisphere.

This data set as a baseline from which future evolution of Triton's suface ice can be measured.