The evidence of latitudinal asymmetry of the ammonia absorption on Saturn

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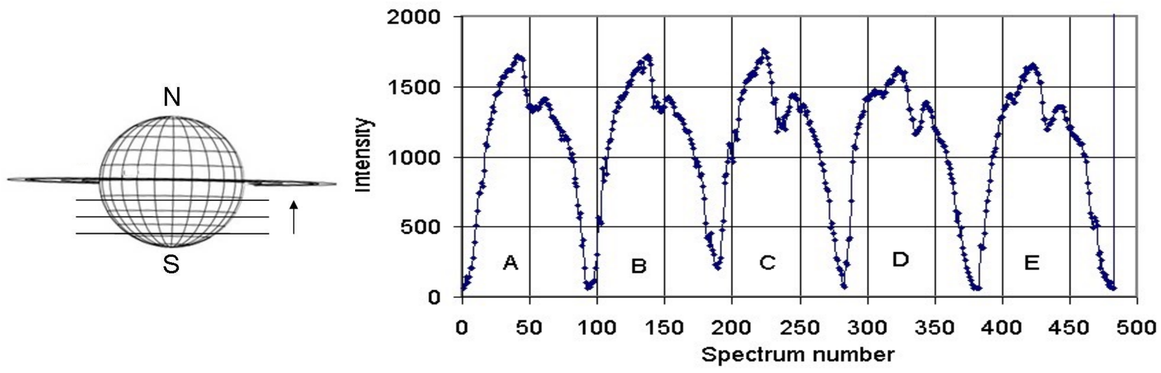
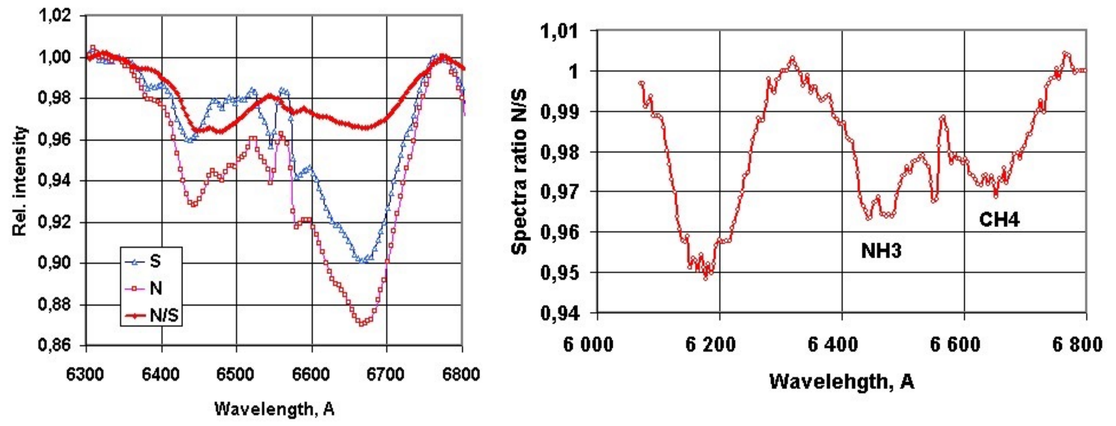
Saturn in the equinox-2009

Our research had been directed to the study of the methane and ammonia. Absorption bands behaviour on different latitudes and comparison of their intensity at Southern and Northern hemispheres. This period is transitional between primary insolation of S-hemisphere in preceding years and the growth of insolation of N-hemisphere during next seven years. We continue the spectrophotometric scanning of Saturn's disk.



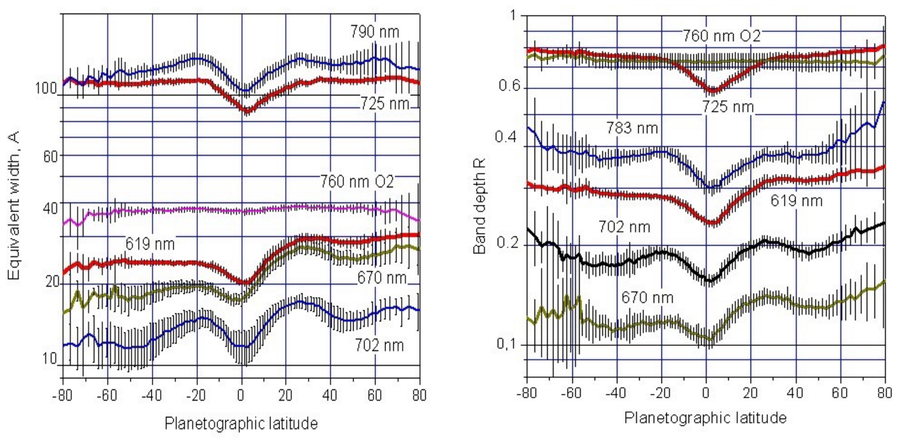
South - North scanning of Saturn for recording zonal spectra (90-100 spectra per scan)

A comparison of the NH3 645nm + CH4 678nm absorption band profiles for S- and N- temperate latitudes and their ratio



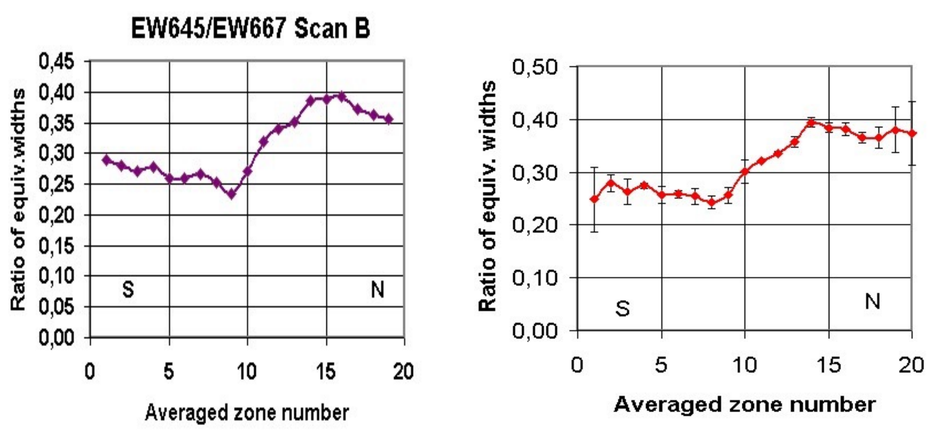
The ratio South/North for CH4 619 nm and NH3 645+CH4 678 nm bands profiles

Latitudinal variations of the methane absorption



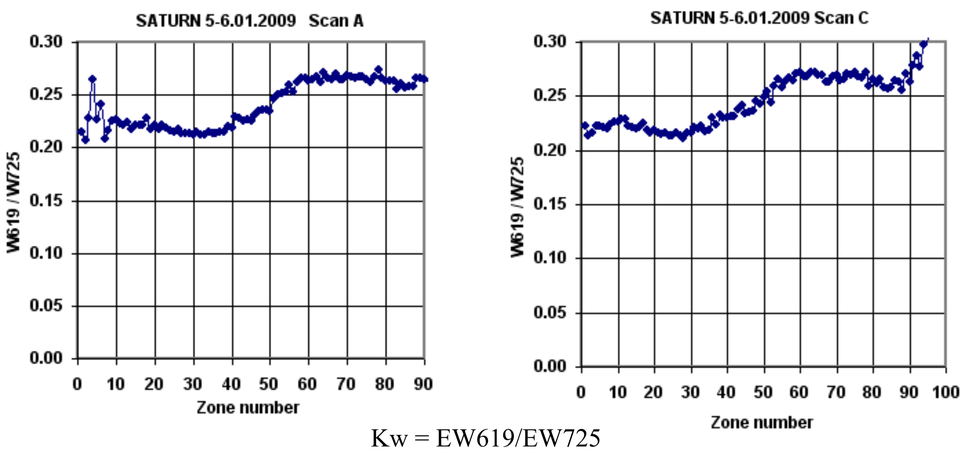
There are the latitudinal variations of the CH4 absorption bands equivalent widths and central depths in logarithmic scale. They were derived from the averaging of 5 scans data in 5 January 2009.

The profiles and equivalent widths ratios of the NH3 645nm and CH4 667nm absorption bands



From one scan — From all five scans

The south - north differences of the relative absorption in 619nm and 725nm methane bands



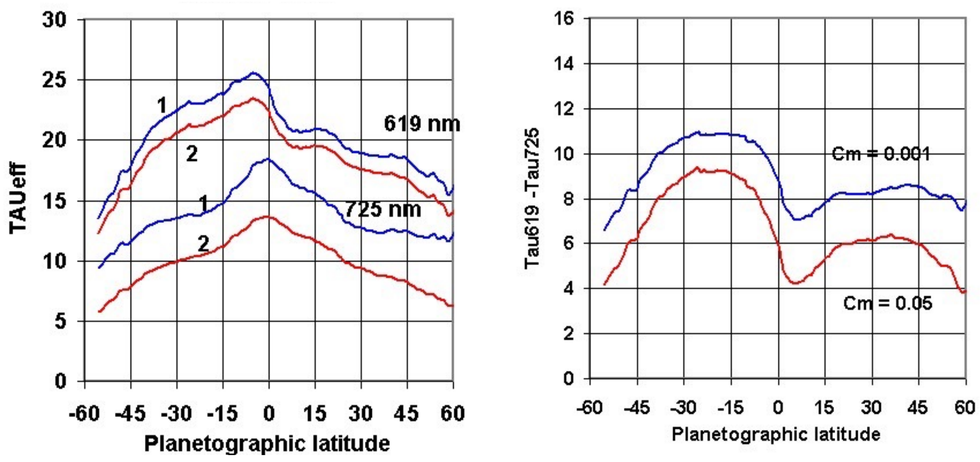
Kw = EW619/EW725

In 2008-2009 Kws=0.215 and Kwn=0.265.

In 2010 an amplitude of S-N differences noticeably decreased: Kws =0.225 but Kwn=0.250.

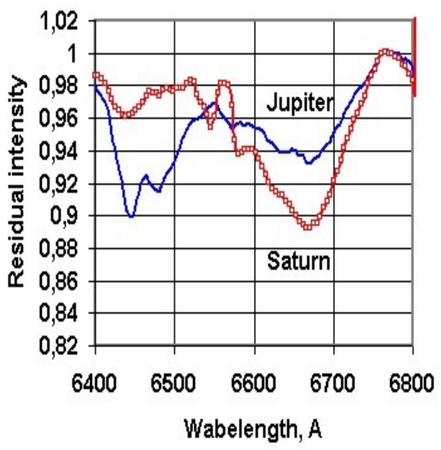
In the beginning of 2008 the temperate latitudes showed extreme Kw values but in the next seasons the latitudinal variations of Kw within one hemisphere were smoothed.

Preliminary estimates of the absorption bands formation effective optical depths for CH4 619nm and 725nm and their differences at two methane abundance Cm [m/amagat]

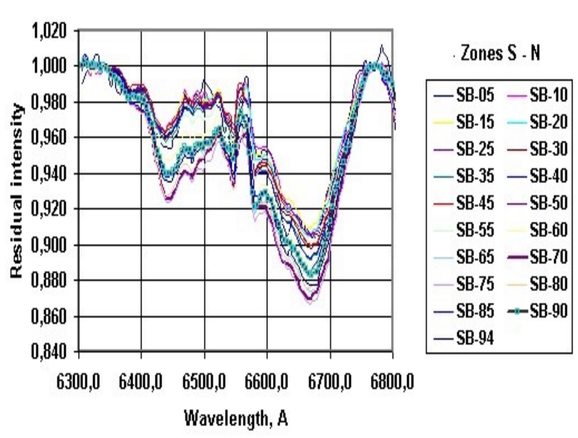


The results show that the increased NH3 absorption in Saturn's northern hemisphere coincides with the increase of relatively weak CH4 absorption bands, observed also in the northern hemisphere. At the same time stronger absorption band of methane, for example, 725 nm band, the similar hemispheric difference is not detected. This may be due to a decrease of the volume density and the aerosol scattering coefficient on the large effective optical depths by raising the temperature. In the upper part of the cloud cover the difference in density of the cloud layer apparently absent or much less pronounced.

The ammonia and methane absorption band NH3 645nm + CH4 678nm



Jupiter and Saturn



Saturn – zonal spectra