THE SPACE-TIME VARIATIONS OF THE MOLECULAR ABSORPTION BANDS ON JUPITER AND SATURN FROM 1995-2007 OBSERVATIONS. V.G.Tejfel [1], V.D.Vdovichenko[1], A.M.Karimov[1], G.A.Kirienko[1], N.V.Sinyaeva[1], and G.A.Kharitonova[1]. [1] Fessenkov Astrophysical Institute, Almaty, Kazakhstan. tejf@hotmail.com

Introduction: The spectral observations of major planets in the Laboratory of Lunar and Planetary Physics of Fessenkov Astrophysical Institute are continued from 1960. From 1995 they are carried out by using CCD-cameras mounted on the prism and diffraction spectrometers. Main goal of these observations is the study of the molecular absorption bands vatiations over the disks of Jupiter and Saturn and their changes in the time.[1].

Observational technique: The simplest way of the spectral observations for the study of latitudinal variations of the absorbtion bands is the recording of the planetary spectra at the entrance slit crossed the central meridian of Jovian or Saturn's disk. More long but more effective way is to record zonal spectra consecutively scanning planetary disk by the slit oriented parallel to equatorial section of the disk. Due to very slow scanning velocity there may be obtained about two hundreds or more zonal spectrograms. Each one may be processed and more accurate profiles of the absorption bands may be derived from these spectra at the same exposition time by summing and averaging of 20 pixels within the central belt of each spectrum.

Main results: In 2006-2007 the visible state of zonal cloud structure on Jupiter was significantly changed in comparison with a view in preceding years. Usually light equatorial zone shows a darkening as well as entire northern hemisphere. Latitudinal variations of the methane absorption bands have shown also noticeable changes(Fig.1). connected with the atmospheric disturbances. Especial interest is represented with the ammonia absorption band 787 nm which was extracted from more strong methane band by the relation to Saturn's spectrum. Latitudinal variations of this NH_3 band show definitely the depression of ammonia absorption in the northern hemisphere on low or temperate latitudes in comparison with southern hemisphere [2-3].Last years this depression was sronger but in 2007 it was extended to equatorial and southern latitudes (Fig.2).

The analysis of the correlations between the moderated (CH_4 725 nm) and weak (CH_4 619 nm) absorption bands intensities on different Jovian latitudes shows an absence of linear or quasilinear dependence as obtained for equatorial belt. In contrast this dependence for meridian spectra has regularly a looplike view and can not be related to the measure errors only. They may be connected with the differences in vertical and hori zontal inhomogeneity of the cloud layers.

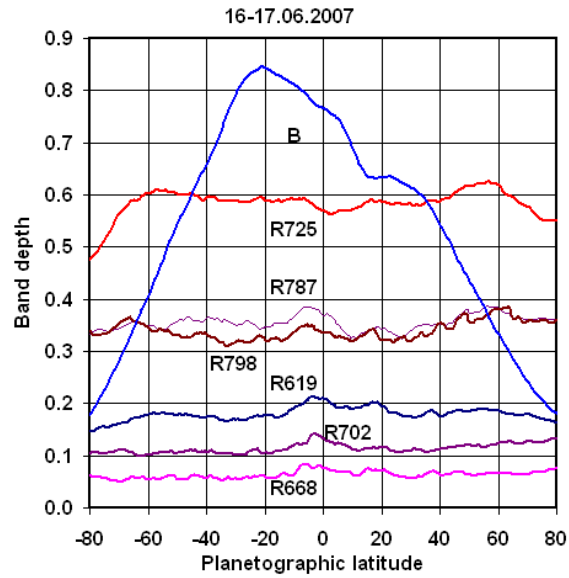

Fig 1. Latitudinal variations of the CH_4 absorption on Jupiter . The central depths of different bands are shown.

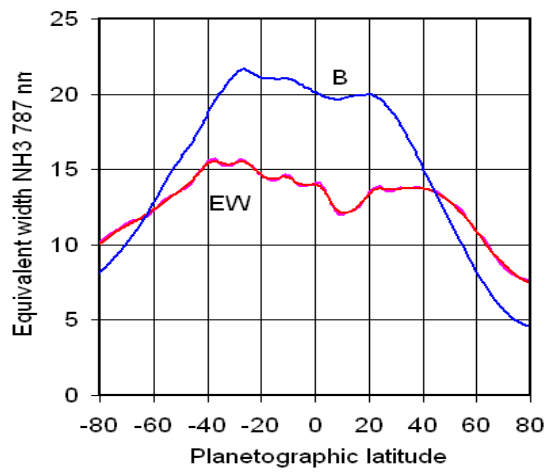

Fig.2. Latitudinal variations of the NH_3 787 nm absorption band equivalent width on Jupiter in 2007.

The similar but some differently expressed zonal and time variations of the methane absorption bands are observed on Saturn. There take place clearly detected seasonal changes strengthened by variable

inclination of N and S hemispheres to sunlight flux and
partially screening of the planet by the rings. In 1995 the equator and rings were oriented "edge-on" towards the Sun and Earth and both hemispheres were at identical condition of the insolation and visibility. However our measurements have found significant asymmetry in the latitudinal distribution of the methane absorption as well as in the limb darkening coefficients in continuum [4]. It must be a result of inhomogeneous insolation for northern and southern hemispheres during preceding 10-12 years. In that time significant part of southern hemisphere has been inclined from the Sun and additionally shielded by the rings (Fig.3).

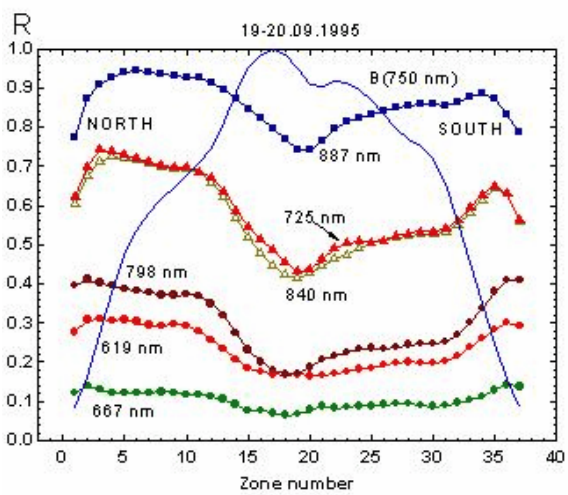

Fig.3. Zonal (latitudinal) variations of the methane absorption bands central depths (R) for the central meridian of Saturn in 1995.

On Saturn as well as on Jupiter the most lowered methane absorption is observed within equatorial belt. It increases towards about -30 deg latitude and decreases on higher latitudes except the polar region where the absorption has a trend to increasing (Fig.4).. The relation between the equivalent widths of the 725 and 619 nm absorption bands shows also looplike graph dependence.

During last 12 years our observations demonstrate a clearly expressed and quasilinear growth of the methane absorption in the southern temperate latitudes (Fig.5) connected with the changes of the insolation in southern hemisphere [5-6]. It may be waiting that when the "edge-on" situation will repeated in 2010 the asymmetry of different optical characteristics on Saturn must be reciprocal to the observed in 1995

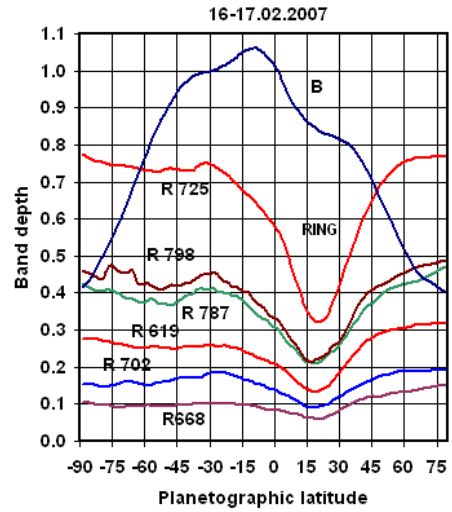

Fig.4. Latitudinal variations of the methane absorption on Saturn in 2007

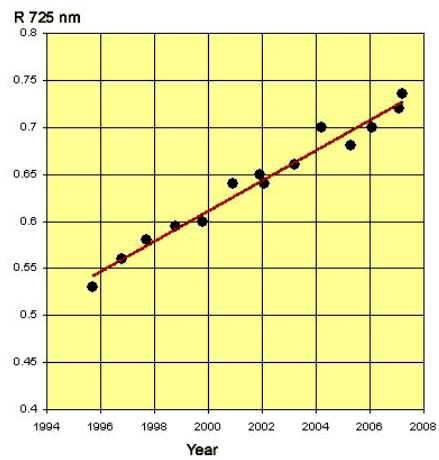

Fig.5. The changes of the CH_4 725 nm absorption band central depth in the southern temperate belt on Saturn in 1995-2007.

References: [1]. Tejfel V.G. (2001).*Planet. Space Sci., 49*,.1347-1358. [2]. Tejfel V.G., Karimov A.M., and Vdovichenko V.D. (2005) *37th DPS Meeting*, Abstract#30.29. [3]. Tejfel, V.G.,. et al.(2005) *Astr&Aph Trans., 24*,.359-363. [4]. Tejfel V.G. (1997) *SolarSyst.Res.,31*,198-206. [5].Tejfel V..G..(2005)*Terrestr., Atmos. and Oceanic Sci. , 16*,. 231-240. [6]. Tejfel V.G.,and Kharitonova G.A (2007) *Geophys. Res. Abstr.,9*, Abstract#A-03178.