CHANGES IN THE ACTIVITY OF THE HEMISPHERES OF JUPITER IN 2016-2017 AGAIN BECAME CLOSE TO PERIODIC. Ya. O. Shliakhetska[1], A. P. Vidmachenko[1], [1]Main Astronomical Observatory of National Academy of Sciences of Ukraine, Str. Ak. Zabolotnogo, 27, Kyiv, 03143, yanashl@i.ua.

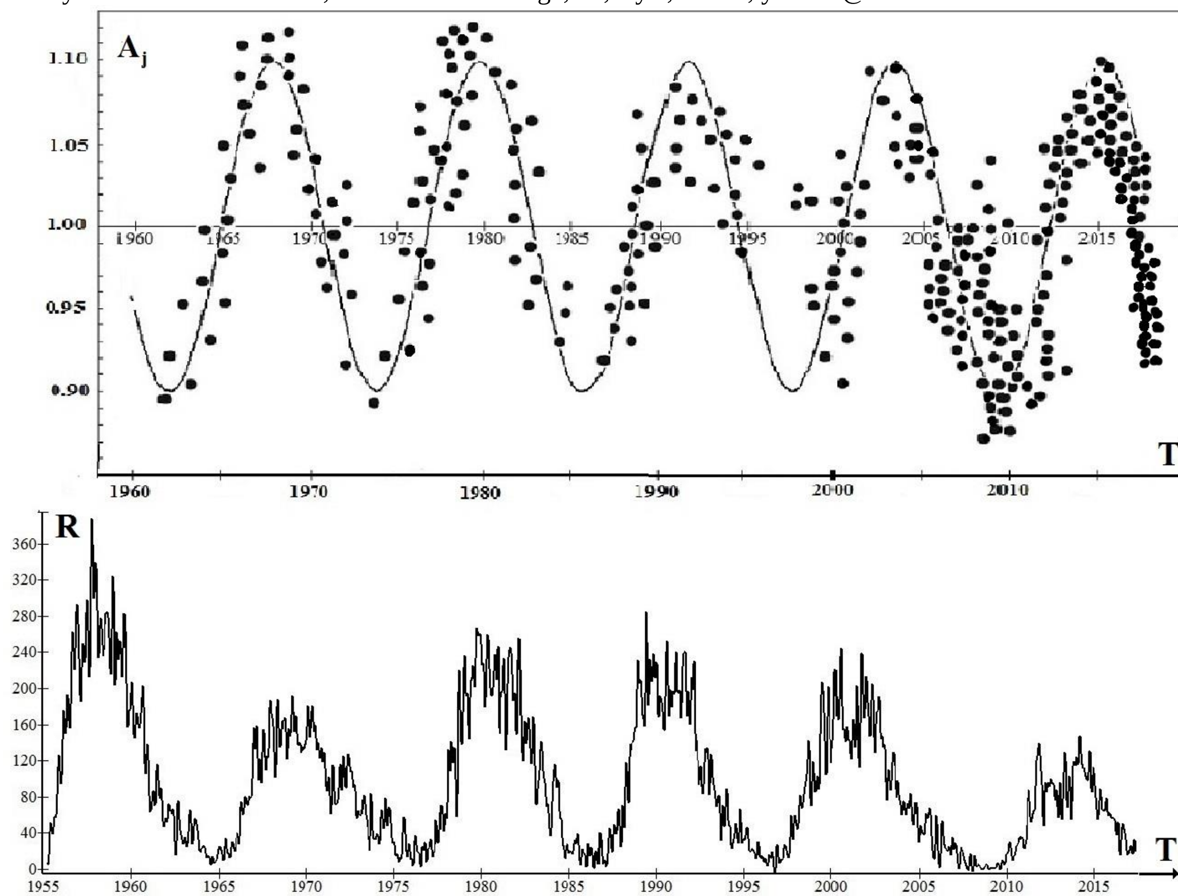

Fig. 1. Top – a change in the activity factor of the Jupiter hemispheres Aj with time T. Below – is the change in the index R of Solar activity with time T (http://sidc.oma.be/html/sidc_graphics.html).

We noted [6-8, 10, 14-16] that even with small (~3.13°) variations in the inclination of the axis of rotation of Jupiter to the plane of the orbit, there is an asymmetry in the meridional distribution of the reflective properties of the clouds [21, 22]. The reason for this is a powerful magnetosphere and variations of the earth's geomagnetic latitude [11-13] by almost 26°. Due to the significant eccentricity of the orbit (e≈0.0485), at Jupiter circulation around the Sun, the influx of solar energy to the atmosphere in different hemispheres of the planet changes by almost 21% [2, 4, 5]. Since the northern hemisphere in the perihelion of the orbit, is tilted toward the Sun at time which close to the summer solstice, that precisely it's that receives a much larger influx of solar energy into the atmosphere. We have shown [21, 22] that the ratio of the brightness of the northern and southern tropical and temperate regions Aj - is an obvious and good factor of the photometric activity of atmospheric processes on Jupiter. And the presence of cyclicity in the variation of Aj with a period of ~11.86 years indicates the existence of a seasonal reorganization of the Jovian atmosphere.

We presented the results of analysis of observations of the planet at 1962-2017. To earlier data [10, 11, 20] we added by results of observations of Jupiter from May to December 2017. According to the procedure given in [15, 16], we digitized and processed 60 images of Jupiter, taken from such sites: http://kardasis. weebly.com/ – Manos Kardasis; http://obs. nineplanets.org/ obs/obslist. html – Amateur Astronomical Observatories; http://www.acquerra.com.au/astro/gallery/jupiter/ index.live – Anthony Wesley, http://www.popastro. com/planetary/index.php.

Our comparison of the variation in integral magnitude of Jupiter Mj in visual rays with variations of the Solar activity according to Wolff numbers W, for a past century and a half have shown [9, 18, 19, 23] that variation of brightness has minima for odd, and maxima for even cycles of solar activity (SA). Changes are detected the apparent brightness of Jupiter with a doubled orbital period value (23.9 years), orbital period (11.88 years) and SA period (11.1 years) were also detected. Solar activity globally affects the planet. And seasonal changes are manifested in the alternation of the optical properties of the different hemispheres of the planet. Due to the presence of several factors influencing the formation of clouds, which have different values of the periods, one can observe the synchronization of their global and local (in the northern or southern hemisphere) effects on the nature of the emerging clouds.

In Fig. 1 (points), we presented the time dependence of the calculated activity factor of the Jupiter hemispheres Aj (T). We agreed the variation of Aj with a sinusoid (line in Fig. 1, above) by the method of least squares. The calculations gave the value of sinusoidal period 11.87±0.06 earth years.

Let's remind, that the passage of Jupiter through the perihelion of the orbit were close to the moments of the summer solstice for the northern hemisphere of the planet in 1963.8, 1975.6, 1987.5, 1998.7, 2010.6. Almost at the same time, the averaged curve of the dependence Aj (T) passed through the minima of its values. In 1968-1970, 1980-1981, 1991-1994, 2003-2004 and 2014-2015 Jupiter passed through the aphelion of its orbit, and the ratio of brightness Aj was maximum. As can be seen from Fig. 1, from 1995 to 2013, there was a noticeable violation of the periodicity in changing Aj relations. Note that it was precisely from the mid-1990s to 2013 that the maximum was the discrepancy between the time of Jupiter's passage in orbit through perihelion and aphelion, and by moments of minima and maxima of Solar activity. Starting in 2013, the agreement between the passage of Jupiter through selected points of the orbit and the cycles of the SA – again became close to coincidence.

That is, in 1963-1995 the correlation between the changes in factor Aj, Solar activity and the moments of passage through perihelion and aphelion of the orbit was high; and changes in the influx of Solar energy to the hemispheres of the planet due to the elongation of the orbit, and due to variations in Solar activity – have been synchronized. After 1995, inconsistency in the supply of Solar energy to the northern and southern hemispheres of Jupiter due to changes in Solar activity and the motion of the planet in orbit – has become significant.

But the decrease in the total influx of Solar energy to the winter northern hemisphere was substantially compensated by the total energy input from the Sun due to the growth of Solar activity. And if the approach of the planet to the Sun at perihelion led to the heating of the atmosphere, then the fact that at the same time the Solar activity was minimal and led to a general "cooling" effect. Such a joint effect on the atmosphere of Jupiter these two factors – led to a mismatch in the periodicities in the character of the brightness variation of the northern and southern hemispheres of the planet.

Thus, our analysis of observational data for 1962-2017 indicates the existence of a seasonal reconstruction in the atmosphere of Jupiter [1, 17]. Analysis of the dependence of the reflective characteristics of the Jupiter hemispheres on the results of observations in visible light in 1962-1995 shows a delay of □5-6 years, as a response to a 21% change in the irradiation of the helium-hydrogen atmosphere [2-4] in different hemispheres during the motion of the planet in orbit. The disagreement between the time dependence of Aj (T), the solar activity index R (T) and the irradiation of Jupiter by the Sun because of its orbital motion – after 2014 they again become consistent [20]. This is manifested in the restoration of the periodicity in the variation of the photometric characteristics of the northern and southern hemispheres of Jupiter.

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