OPTICAL MONITORING OF NGC 4151: BEGINNING OF SECOND CENTURY

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ABSTRACT. We present the historical light curve of NGC 4151 for 1906 – 2012. The light curve (Oknyanskij anf Lyuty, 2007) is primarily based on our published photoelectric data (1968 - 2007, about 1040 nightly mean measurements) and photographic estimates (mostly Odessa and Moscow plates taken in 1906–1982 (Oknyanskij, 1978, 1983), about 350 measurements). Additionally, we include all data obtained prior to 1968 (de Vaucouleurs and de Vaucouleurs, 1968; Sandage, 1967; Wisniewski and Kleinmann, 1968; Fitch et al., 1967) in total, 19 photoelectric observations from 1958–1967, reduced by us to the same diaphragm aperture as that used in our measurements) as well as photographic data (Pacholczyk et al., 1983) (Harvard and Steward observatories' patrol plates taken in 1910–1968, about 210 measurements).

The light curve includes our new photoelectrical and CCD data obtained during last 5 years. All these data were reduced to an uniform photometric system.

Key words: AGN, optical variability, historical light curve

NGC4151 is one of the most popular and well studied AGNs, it is most bright and high variable object, which is very often used as an example object: typical Sy1, typical Sy1.5, typical object changing classification type between Sy1 and Sy1.9. Now about the same cases of untypical variations were found for more then 10 AGNs. So it is more likely typical than untypical option for AGNs and it has to be explained in some unification model.

NGC 4151 – is one of the several Seyfert galaxies which were firstly discovered at 1967 as variable in optical region (Fitch et al., 1967). Shortly after that (at 1968) the photoelectric UBV monitoring of NGC 4151 object was started at Crimean Laboratory of Sternberg Astronomical Institute (Lyuty, 1977). Variability of the object before 1967 can be investigated only from the archive photographic observations and a few number of isolated photoelectrical observations. First long term optical variability investigations using photographic archive data (Harvard plates taken in the years 1932–1952 and Steward plates taken in the years 1956–1968) were published (in graphic form only) by Pacholczyk (1971). Our long term photometry of NGC 4151 using Odessa plates (1952–1975) was published in table and graphic forms Oknyanskij (1978). Then Pachalczyk et. al. (1983) published more complete photometrical data started from 1910 (in table form also). Finally, variability of NGC 4151 during 1906–1911 years was investigated using old Moscow plates (Oknyanskij, 1983). The longest uniform series of photometric observations was obtained of one us (Lyutyi, 1977), and so all other observations, as far as possible, were reduced to the system of the series (see details at Lyuty and Oknyanskij, 1987). Long-term historical light curve in filte B, including photographic and photoelectric data, was published by Lyuty and Oknynskij (1987), and then continued for the 100 years interval (Lyuty 2006, Oknyanskij and Lyuty, 2007). Our data were reproduced at historical light curves many times (for example by Czerny et al. (2003).

At the present work we continue the optical monitoring of NGC 4151. Our new data (118 nights) include the photoelectric UBV photometry (with the same telescope and equipments). Also we get CCD data, which were taken with the 4096x4096 SNUCAM camera mounted in 1.5-m reflector of Maidanak Observatory (Uzbekistan) and with the Apogee 47p camera mounted in the Cassegrane focus of the 0.6-m reflector at the Crimean Laboratory of the Sternberg Astronomical Institute.

The historical light curve of NGC 4151 in filter B for 1906-2012 years is presented at Fig. 1. The light curve with our new data (only filter B) for 2008-2012 years is shown at Fig. 2. At the light curves (Fig, 1 and 2) we can see different variable components: 1 – fast variations with time about tens of days, 2 – slow variations with time about several years, 3 – very slow component with time about tens of years. It is clear seen that after minimuma at 1984 the type of variability is not the same as it was before: the amplitude of the fast variations become smaller relative to the slow ones.

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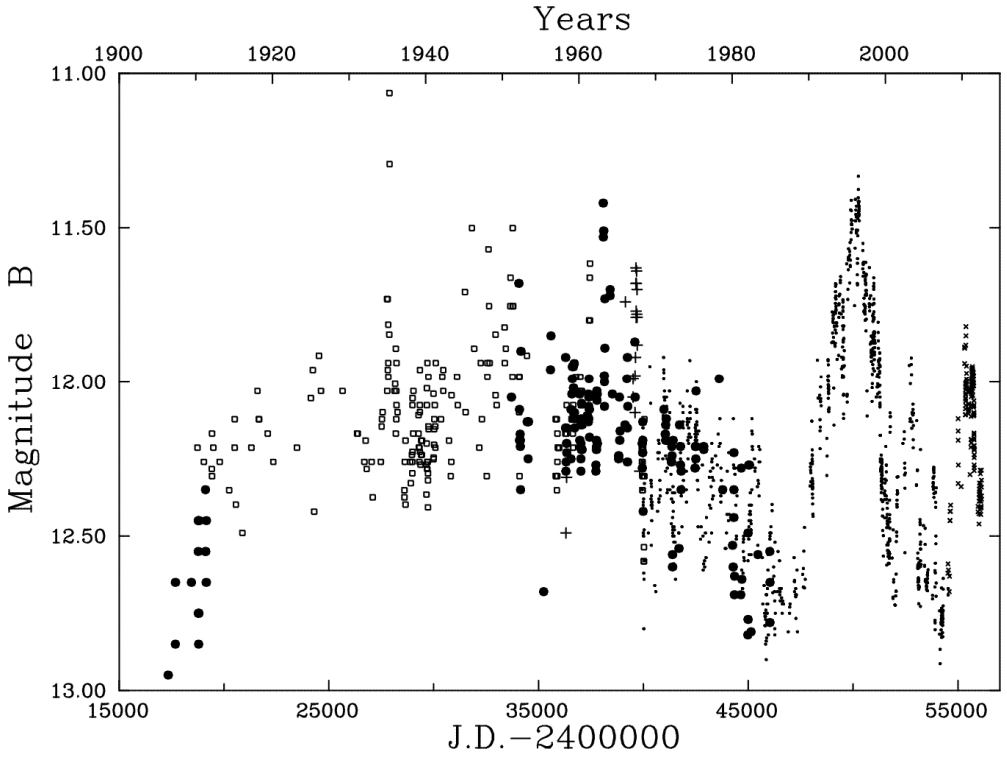

Figure 1: The historical light curve of NGC 4151. Filed circles – our photographic data, open circles – Pacholszyk et. al. (1983), pluses – photoelectric data obtained before 1968, dots – Crimean photoelectric monitoring, x – our new photoelectric and CCD data. The errors are of the order of 0.2 mag for Pachalcsyk's data, 0.1 mag or better for our photographic points, and ~ 0,02 mag for out photoelectric and CCD data.

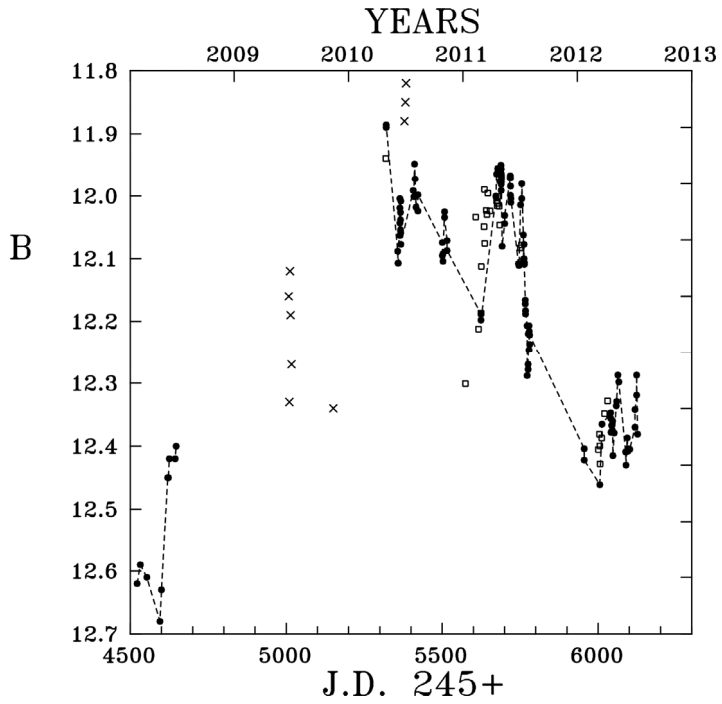

Figure 2: The light curve of NGC 4151 at 2008-2012. Our new, unpublished before data: filed circles – photoelectric data, x – Maidanak CCD observations, boxes – Crimean CCD data.