

COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 6073

Konkoly Observatory
Budapest
26 August 2013

HU ISSN 0374 – 0676

FOLLOW-UP OF MASTER OTJ204200.48+041839.9

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Following the telegram by Denisenko et al. (2013) we observed the transient source MASTER OT J204200.48+041839.9 with the 30 cm telescope of the Foligno Observatory and a Nikon D90 camera. Images were taken in sequences of 15 with 30 s exposure each and then aligned and summed to achieve exposure times of 450 sec. Nearly all sequences were taken in monochrome mode, while one sequence was taken in color (RGB) mode to get the $B - V$ of the source. Aperture photometry was performed with IRAF/apphot, using a comparison sequence of about 35 nearby stars from the APASS (UCAC4, Zacharias et al. 2012) catalog down to $V=15.0$. The slope of the linear fit between instrumental (monochrome) and catalog V magnitudes was always nearly 1 with a rms deviation of 0.11 mag. We checked the presence of a color bias between our instrumental magnitudes and the UCAC4 ones: the comparison stars have $B - V$ colors ranging between 0.0 and 1.2 and are well distributed in V magnitude, so that this check was quite feasible. We actually found a slight trend of our V magnitudes derived from the monochrome images with the $B - V$ color. The correction is not large, $C = -0.285 \times (B - V) + 0.200$; it is smaller than our statistical error for intermediate spectral type stars ($B - V$ about 0.6) and appreciable only for very early or late spectral types.

Aperture photometry on the color image gave $B=15.9$ and $V=15.7$, again with slope very close to unity and rms deviations of 0.10 mag. A scatter plot of our $B - V$ colors for the reference stars against the UCAC4 values shows a systematic trend: the best fit line gives $(B - V)_{\text{ucac}} = 1.33(B - V)_{\text{our}} - 0.20$: for our variable the correction is therefore only +0.06 mag, smaller than the statistical error of our calibration regressions, both in B and in V . The astrophysical result is a clear indication of a rather blue color ($B - V=0.26$) for the source, as expected for a cataclysmic variable in outburst or a VY Scl type star.

The V magnitudes of the star, derived from the monochrome images, corrected by +0.13 mag for the color effect discussed above, are reported in Table 1: errors are always 0.10 mag. From this Table a flux decrease rate of at least 0.4 mag/day after 2 August 2013 is evident.

Table 1. Observed V magnitudes of MASTER OT J2042+0418.

date	JD	B	V
2013-08-01.88	2456506.32	16.09	15.83
2013-08-02.88	2456507.32		15.94
2013-08-06.90	2456511.33		>17.5
2013-08-09.90	2456514.33		>17.5

We searched for previous observations of this star in the Asiago direct plate archive (Barbieri et al. 2003), finding none and in the objective prism Digitized First Byurakan Survey (DFBS, Mickaelian et al. 2007) accessible on-line,¹ finding two plates. The star was clearly detected in the first plate, n.0907 (IIaF emulsion) taken on 19 October 1973 while it was undetected in the second one (n.1388, IIF emulsion) taken two years later on 6 November 1975, with magnitude limit $R=16.3$.

The star showed a quite blue continuum: unfortunately the low S/N level prevents a reliable identification of possible emission lines. Its magnitudes, retrieved from the DFBS archive, derived by integration of the spectrum on the proper wavelength bands, are $B=15.55$ and $R=15.28$ in the USNO-A2 scale.

Using the same set of reference stars used for our photometry, we derived a linear conversion from the USNO-A2 to the UCAC4 system for the B and r bands: the correlation coefficient was better than 0.98 and the results were $B=16.09$, $r=15.70$. The blue color found at the DFBS epoch, when the source was in a high state, is in fair agreement with that found by us in the flare of 1 August 2013 and with the $g - r=0.18$ color reported in the SDSS database, measured on 15 September 2004.

Denisenko et al. (2013) suggest a classification of this star as a VY Scl type: this kind of stars is characterized by long stays at high flux level, with short but deep faint phases (see e.g. the light curve of VY Scl on the AAVSO website). The sparse light curve of this variable, recorded by the CSS survey in the years 2006-2012, shows that the star oscillates between $V=18.5$ and $V=15.8$ without a preferred flux level, with only one recorded episode below the 19th magnitude. It is therefore rather different from the typical cataclysmic variable light curve and more similar to a VY Scl: also the fact that the SDSS, several POSS plates and the DFBS found the star in a high state favours this classification.

References:

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¹<http://byurakan.phys.uniroma1.it/>