

MASTER OT J190519.41+301524.4: A New Eclipsing Cataclysmic Variable of the VY Scl Type

F. Martinelli¹, D.V. Denisenko²

¹ Astronomical Center Lajatico, Italy

² Sternberg Astronomical Institute, Lomonosov Moscow State University, Russia;
e-mail: d.v.denisenko@gmail.com

MASTER OT J190519.41+301524.4 was discovered as a 15^m.7 optical transient by the Mobile Astronomical System of TElescope-Robots (MASTER) in March, 2014. We report the results of photometric observations of this variable performed at the Lajatico Astronomical Center in June–July, 2015. The light curve shows deep V-shaped eclipses with an amplitude of two magnitudes. The orbital period was determined to be 0^d.129694 (3^d.113). Based on the archival observations and the shape of the orbital curve, we suggest that MASTER OT J190519.41+301524.4 is a new cataclysmic variable of VY Scl type (“anti-nova”), with an inclination angle close to 90°.

1 Introduction

MASTER OT J190519.41+301524.4 is an optical transient in Lyra discovered on March 6, 2014 (Denisenko et al. 2014) by MASTER-Kislovodsk auto-detection system (Lipunov et al. 2010). The previously unremarkable star was found to be highly variable on the digitized Palomar plates. Namely, the star was bright on the 1950 June 17 POSS-I plate, but very faint on the 1987 June 21 POSS-II plate (see Fig. 1). These brightness changes are clearly seen from the magnitudes reported in different catalogs. Namely, the USNO-B1.0 catalogue (Monet et al. 2003) is listing USNO-B1.0 1202-0321874 with $B1 = 16.32$, $R1 = 15.65$, $B2 = 17.84$, ($R2$ magnitude not available), $I = 16.39$, while GSC 2.3.2 is giving $F_{\text{mag}} = 19^{\text{m}}.41$ measured from the 1987 June 21 Palomar plate. The star is an ultraviolet source GALEX J190519.4+301525 with the far and near UV magnitudes $FUV = 17.66 \pm 0.05$, $NUV = 17.46 \pm 0.04$ respectively. Based on this information, Denisenko et al. suggested that MASTER OT J190519.41+301524.4 was a cataclysmic variable, most likely an anti-nova of the VY Scl type in the high state.

In this paper, we report the results of our observations of MASTER OT J190519.41+301524.4 obtained in June–July, 2015 in the Lajatico Astronomical Center in Italy. We detected deep eclipses in this compact binary system, measured its orbital period, and confirmed its classification as a VY Scl cataclysmic variable.

2 Photometry

Our observations of J1905+3015 were performed in the Lajatico Astronomical Center in Italy (<http://www.astronomicalcentre.org/>) located in Tuscany region, 40 km southeast of Pisa. Data were taken on seven nights (2015 June 28, 30; July 7, 12, 15, 17, and

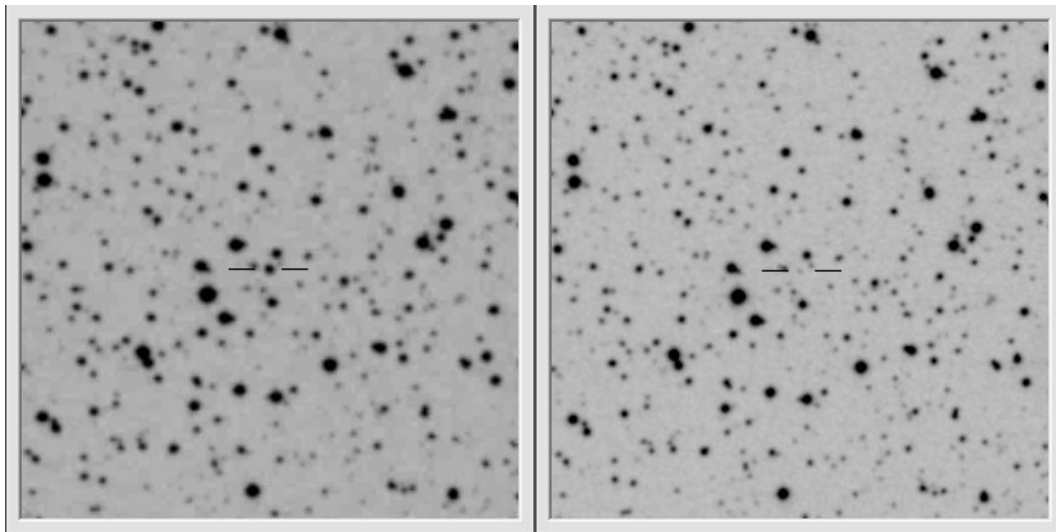


Figure 1.

MASTER OT J190519.41+301524.4 on digitized Palomar Red plates. Left: 1950 June 17 (bright state); right: 1987 June 21 (faint state). The FOV is $5' \times 5'$. North is on top and east is to the left.

18) using the 0.36-m Cassegrain telescope with an SBIG ST-8XME CCD. A total of 203 unfiltered images with 300-s exposures were obtained (26, 11, 35, 23, 34, 35, and 37 images covering 2.9, 1.4, 3.7, 2.8, 4.1, 3.0, and 3.8 hours, respectively). A nearby star USNO-B1.0 1202-0321923 ($0.6'$ to the east and $0.2'$ to the south of the variable), with the magnitude $V = 12.8$, was used as a reference star.

The observation times were converted from JD to Barycentric Julian Date using the online period search service (<http://scan.sai.msu.ru/lk/>) by Kirill Sokolovsky. Using the Lafler–Kinman and Deeming methods, we have obtained the best period value $0^{\text{d}}129694(2)$, or $3^{\text{h}}113$. The phased light curve from our observations is presented in Fig. 2. It shows deep eclipses with a total amplitude about 2^{m} and variations by $0^{\text{m}}3$ near the maximum light. Our search for secondary periods has not detected any additional periodic signals at higher frequencies.

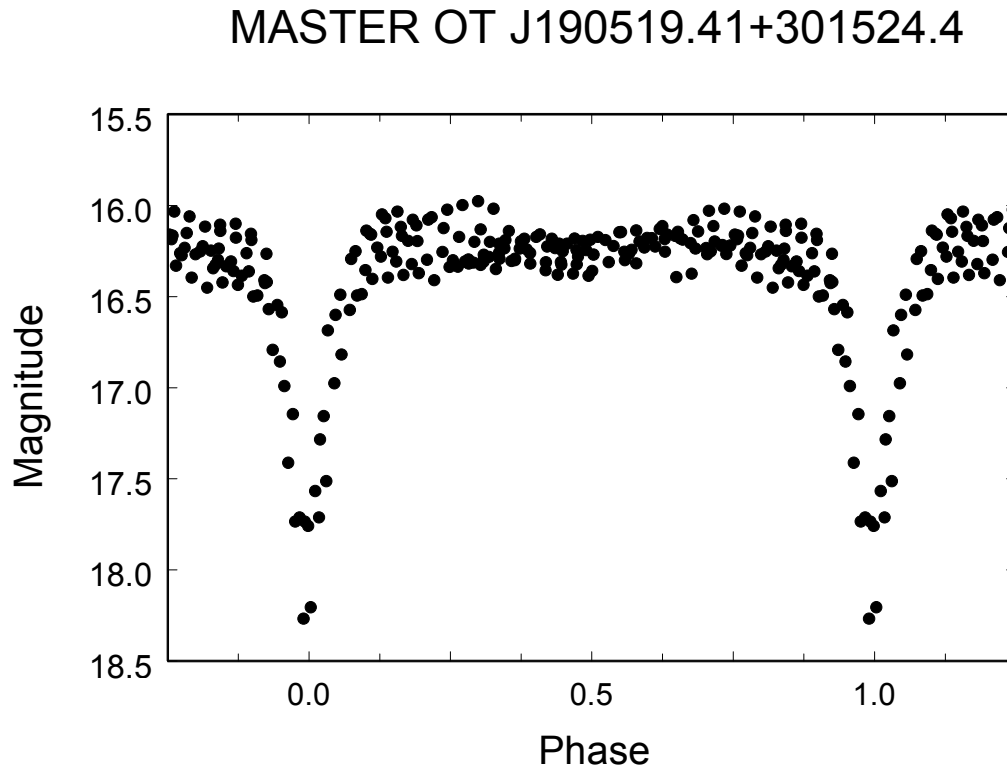
The light elements of J1905+3015 obtained from our observations are:

$$\text{Min} = \text{HJD}2457202.428 + 0^{\text{d}}129694 \times E.$$

3 Discussion

The deep fading of J1905+3014 observed on the 1987 POSS-II Red plate can be explained either with the low state of a polar (magnetic CV without an accretion disk) or with the drop of accretion rate in a variable of the VY Scl type (“anti-nova” with a disk). Our observations are strongly in favor of the second scenario. The V-shaped eclipse of a long duration (about 20 per cent of the orbital period) is consistent with the presence of quite a large accretion disk. The system was not detected by the ROSAT all-sky survey (Voges et al. 2003). If J1905+3014 were a magnetic CV with a range of $16 - 18^{\text{m}}$, it should have been present in the ROSAT catalog.

MASTER OT J190519.41+301524.4 turns out to be an eclipsing cataclysmic variable of the VY Scl type. Such systems are quite rare. The catalog of cataclysmic binaries by

**Figure 2.**

The light curve of J1905+3015 from Lajatico data (June–July, 2015) folded with the best orbital period, $P = 0^d129694$, and the initial epoch $T_0 = 2457202.428$ (HJD).

Ritter and Kolb (2003; Version 7.23 of July 2015) lists only eight nova-like variables with eclipses (NL+E), but none of them is classified as an “anti-nova”. Interestingly enough, all of them have orbital periods longer than 0^d133 . The phased light curve of the binary system J1905+3015 resembles that of V482 Cam = HS 0728+6738 (Rodríguez-Gil et al. 2004), which belongs to the subgroup of eclipsing SW Sextantis stars. It is possible that J1905+3015 is also an SW-type variable. We encourage continued monitoring of this new CV to follow its return to the low state. When the system fades back to the 18–19^m level, it will become a good target to measure the size of the accretion disk and to determine the orbital inclination from changes in the depth and duration of the eclipse.

References:

- Denisenko, D., Balanutsa, P., Lipunov, V., et al., 2014, *Astronomer’s Telegram*, No. 5953
- Lipunov, V., Kornilov, V., Gorbovskoy, E., et al., 2010, *Adv. in Astron.*, 2010, Art. ID 349171
- Monet, D. G., Levine, S. E., Canzian, B., et al., 2003, *Astron. J.*, **125**, 984
- Ritter, H., Kolb, U., 2003, *Astron. & Astrophys.*, **404**, 301
- Rodríguez-Gil, P., Gaensicke, B. T., Barwig, H., et al., 2004, *Astron. & Astrophys.*, **424**, 647
- Voges, W., Aschenbach, B., Boller, T., et al., 1999, *Astron. & Astrophys.*, **349**, 389