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DISCOVERY OF CVS ROTSE3 J151453.6+020934.2 AND ROTSE3 J221519.8-003257.2

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The ROTSE-III telescope array is a worldwide network of 0.45 m robotic, automated telescopes, built for fast ($\sim$ 6 s) responses to Gamma-Ray Burst (GRB) triggers from satellites such as Swift. They have a wide 1.85 degree field of view imaged onto a Marconi 2048 $\times$ 2048 back-illuminated thinned CCD, and operate without filters, and we have a wide passband that peaks around 550 nm. The ROTSE-III systems are described in detail in (Akerlof et al. 2003). While not observing GRB triggers, the ROTSE-III systems engage in a search for short duration transients. High galactic latitude equatorial fields are scanned every night, with two pairs of images taken with a 30 minute cadence. Our search is optimized for finding transients lasting $\sim$1 hr above our limiting magnitude of 19, although we also detect longer transients including cataclysmic variables (CVs). In this bulletin we report on the discovery of two such CVs in 2004.

On 29 March, 2004, the ROTSE-IIIb telescope located at McDonald Observatory, Texas, detected a bright $16^{\rm th}$ magnitude object, which we designate ROTSE3 J151453.6+020934.2 (hereafter J1514). Only 20 hours earlier, on 28 March, 2004, the ROTSE-IIIa telescope located at Siding Spring Observatory had imaged the same field, and had not detected an object to a limiting magnitude of 18.2. The ROTSE-III observations were processed by our standard pipeline. We measure aperture magnitudes using SExtractor (Bertin & Arnouts 1996), and then compare all the field stars to the USNO A2.0 R-band catalog to obtain an astrometric solution and to perform basic photometry to calculate at m_{ROTSE}.

The complete ROTSE-III light curve for J1514 is shown in Figure 1. After outburst, the transient remained bright around $m_{ROTSE} = 17$ for two weeks before fading below our threshold, rebrightened for two days, and faded back to quiescence.

On 18 June, 2004, J1514 was observed in UBVI at the MDM Hiltner 2.4m telescope, on Kitt Peak, Arizona. Two sets of images were taken, with the colors listed in Table 1. Figure 3 shows the I-band image from the 18 June dataset. These colors are consistent with a dwarf nova around minimum light. Furthermore, the variation in the V magnitude between the two observations is statistically significant and not seen in a check star; such flickering is also consistent with a dwarf nova.

On 9 July, 2004, a second CV was detected by the ROTSE-IIId telescope located at Bakirlitepe, Turkey at $m_{ROTSE} = 17.5$, which we designate ROTSE3 J221519.8-003257.2. On 8 July, the previous night, ROTSE-IIId had imaged the same field, and did not detect any object at the transient location to a limiting magnitude of 17.5. The nova faded over the next two days, as can be seen in Figure 2.

Reanalysis of archival ROTSE-IIIb data, which was not previously searched for transients, reveals an earlier outburst on 22 July, 2003 to $m_{ROTSE} = 16.8$. We do not know how long the outburst lasted, since we do not have good images of the field in the following weeks. In addition, the SDSS DR2 (Abazajian, et al. 2004) includes a likely faint counterpart with colors consistent with a dwarf nova at minimum light (Szkody et al. 2002). The SDSS magnitudes are listed in Table 2.

Each of these objects is at a high galactic latitude (48° and −44° respectively), and they each have very dim quiescent counterparts, which is unusual for galactic CVs. However, there have been other such CVs observed (Howell et al. 1997, Szkody et al. 2002), including one discovered by ROTSE-III (Smith et al. 2002). It seems more such CVs have not been found due to selection effects. Although we do not have spectroscopic confirmation, the light curves and quiescent colors of these objects lead us to conclude that these are both galactic cataclysmic variables.

Table 1. The MDM Four-color Intensity Measurements for ROTSE3 J151453.6+020934.2 during quiescence.

UTD	$U-B$	$B-V$	V	$V-I$
040618.33	-1.217 ± 0.046	0.077 ± 0.027	20.055 ± 0.021	0.537 ± 0.038
040618.34	-1.206 ± 0.043	0.124 ± 0.030	20.285 ± 0.022	0.561 ± 0.041

Table 2. The SDSS Five-color Intensity Measurements for ROTSE3 J221519.8-003257.2 during quiescence.

UTD	u'	g'	r'	i'	z'
011015.2	21.44 ± 0.14	21.69 ± 0.06	21.38 ± 0.06	21.25 ± 0.07	20.74 ± 0.18

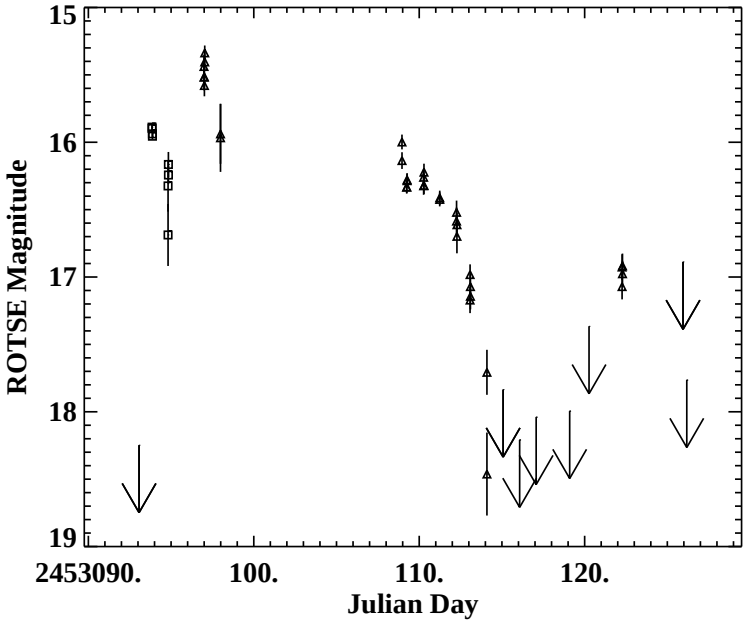

Figure 1. Light curve for ROTSE3 J151453.6+020934.2. The triangles represent data from ROTSE-IIIa and the squares from ROTSE-IIIb. The ROTSE-III unfiltered magnitudes of the object have been calibrated relative to the USNO A2.0 *R*-band colors of the field stars. Arrows indicate the mean limiting magnitudes of pairs of images in which the source was not detected.

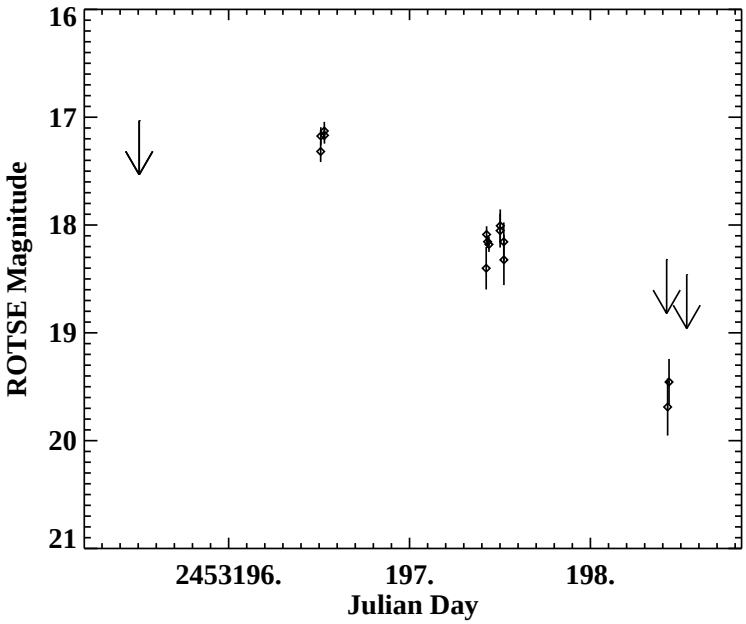

Figure 2. Light curve for ROTSE3 J221519.8-003257.2. The diamonds represent data from ROTSE-IIId. The ROTSE-III unfiltered magnitudes of the object have been calibrated relative to the USNO A2.0 *R*-band colors of the field stars. Arrows indicate the mean limiting magnitudes of pairs of images in which the source was not detected.

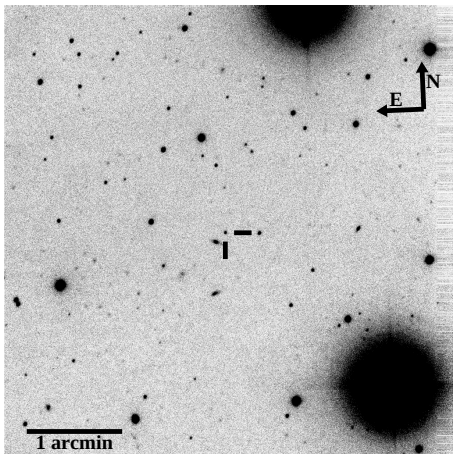

Figure 3. MDM I-band image of ROTSE3 J151453.6+020934.2 during quiescence.

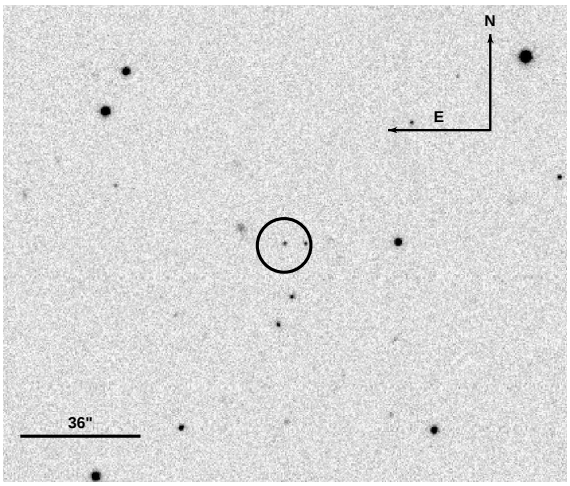

Figure 4. SDSS r'-band image of ROTSE3 J221519.8-003257.2 during quiescence.

References:

Abazajian, K., *et al.* 2004, *AJ*, **128**, 502.
Akerlof, C. W., *et al.* 2003, *PASP*, **115**, 132.
Bertin, E. & Arnouts, S. 1996, *A&AS*, **117**, 393.
Howell, S., *et al.* 1997, *MNRAS*, **287**, 929.
Smith, D. A. *et al.* 2002, *IBVS*, **5226**, 1.
Szkody, P., *et al.* 2002, *AJ*, **123**, 430.